97TH YEAR AGA-PCGA CONVENTION ISSUE OCTOBER 1955
Vol. 182 — No. 10

AMERICAN Gas Journal

GREAT SERIES OF REGULATORS

THE LIBRARY OF CONGRESS
SERIAL
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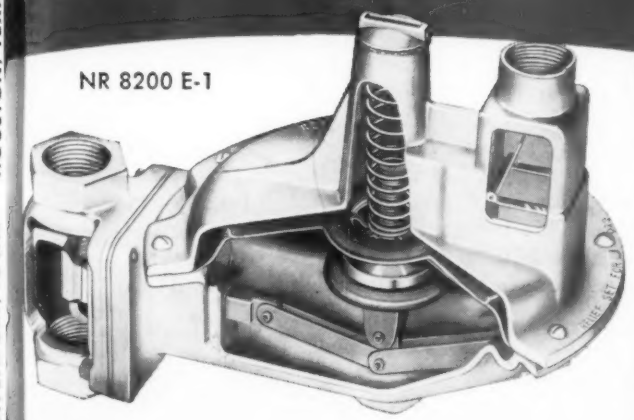
LIBRARY OF CONGRESS
OCT 20 1955
SMITHSONIAN DEPOSIT

NR 8200 series

NR 8310 series

INSTALLS IN ANY POSITION ON A 90° SETTING

NR 8200 E-1



NRF 8310 EVH

House Service regulator with full capacity internal relief valve, mercury seal, or no seal type—¾" to 1½" connections available with extended vent, non-removable vent, or inverted vent—125 PSI. ASA connections.

Industrial and small district regulator available and interchangeable with 1" to 2" screw connection. 2" 125 lbs. or 250 lbs. flange connection. PSI. to ounces, PSI. to PSI. Body units. 3" W.C. to 50 PSI., Outlet pressure. 300 PSI. inlet pressure.

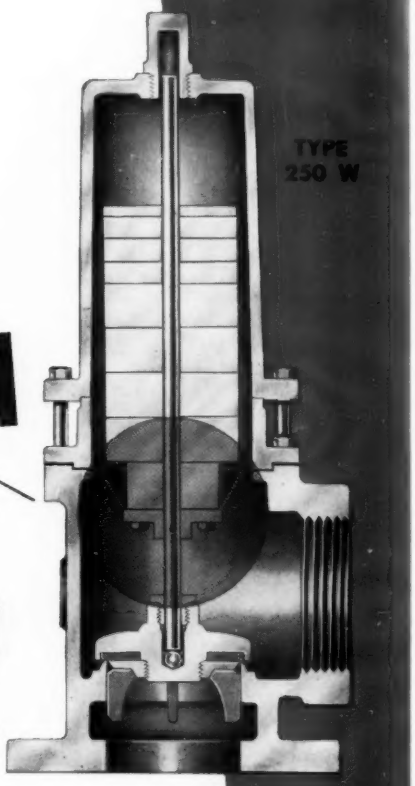
No pipe wrench needed for inspection of (parts) orifice and valve seat.

GAS CONTROL SINCE 1892

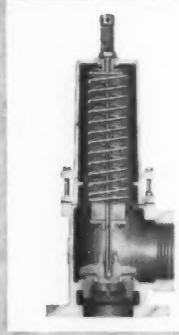
REYNOLDS REGULATOR CO.
ANDERSON, INDIANA, U.S.A.

BRIDGEPORT, CONN. DAVENPORT, IOWA HOUSTON, TEXAS LOS ANGELES, CALIF. SAN FRANCISCO, CALIF.

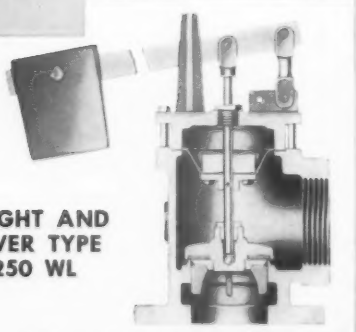
WHAT A DIFFERENCE A "D" MAKES in the NEW CHAPLIN-FULTON High Capacity *Safety Valves*



"D" stands for diaphragm, and what a difference it makes in the discharge ability of the new Chaplin-Fulton High Capacity Safety Valves—2½ times more flow capacity. After initial opening, the discharge pressure acting upward on the diaphragm insures maximum opening, and guarantees full flow with minimum increase in in the blowing pressure. This means greater protection for the users of Chaplin-Fulton Type 250 Safety Valves, adaptable in three models to all gas systems from ounces to 100 pounds. Sizes 2″ to 6″ inclusive.



SPRING TYPE
250 S



WEIGHT AND
LEVER TYPE
250 WL

Simple.... Foolproof

ACCURATE DEPENDABLE

CF MFG. CO.

Chaplin-Fulton

MANUFACTURING COMPANY

Pittsburgh 25, Pennsylvania

SV-53-1

THEY GO BEST TOGETHER

The best gas odorant — The best odorant service

Alert "80"
The best economy-priced, quality mercaptan

Calodorant "C"
The best quality cyclic sulfide

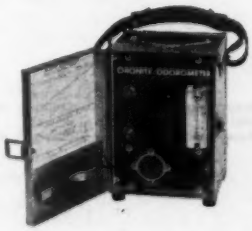
ALERT "80" This versatile odorant has been proved in all types of distribution systems under today's more demanding operating conditions. It gives better, full-range volatility and stronger initial "punch" and has met every test by both large and small utilities.

CALODORANT "C" You will find it the only gas odorant in use that is completely volatile under the most extreme high-pressure or low temperature operating conditions. It also performs equally well at medium and low pressures.

Specialists in odorization problems!

Our gas odorization experience dates back to 1927. Competent research over the years has answered many a gas odorization problem. Chances are we have the answer to any problems you may have.

New, simple "room-testing" device!



Oronite's unique Odorometer offers a new, simple way to test odor intensities in distribution systems. Ask for demonstration.

ORONITE CHEMICAL COMPANY

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Portland Gas & Coke Company retains United Engineers for major expansion program

Portland Gas & Coke Company is engaged in an extensive natural gas program for Portland, Oregon. They have decided to use the highly specialized experience and varied skills of United Engineers to further this project.

We will provide engineering—as well as construction supervisory and inspection service—for five pipelines totaling some 80 miles and including a river crossing. The Company has also retained United Engineers to design and construct two city gate regulating stations and a gas mixing station.

You, too, may well be able to use to advantage our

CONSTRUCTION-INSPECTION SERVICES

in your gas main construction programs. These services are flexible—adjustable to your needs. They range from the furnishing of a field inspector to the execution of a complete major project.

We have experienced men well qualified to see that your specifications are met in every particular.

UNITED ENGINEERS

& Constructors Inc

U.E.&C. (Canada) Ltd.

New York 17 • PHILADELPHIA 5 • Chicago 2

AMERICAN
Gas Journal

VOLUME 182 — 97TH YEAR : : OCTOBER, 1955 — NUMBER 10

This month...

WE SALUTE the American Gas Association Pacific Coast Gas Association meeting in Los Angeles with this special Convention Issue. Mindful that stay-at-homes, as well as convention delegates, turn to American Gas Journal for current utility operations, we retain our usual operating emphasis. In keeping with Convention locale most articles originated from PCGA member companies.

FROM PACIFIC GAS LIGHTING we report turning of a depleted oil field joining a residential area into underground storage.

INTERESTED IN SPEEDING up your bookkeeping departments? Read how Southern Counties Gas mechanized its accounting and billing methods.

AN UNORTHODOX METHOD of natural gas delivery was recently accomplished by Southern California Gas who shipped 22,566 cu ft of gas from California to Oregon by rail.

WEATHER FORECASTING, always a provocative subject, and its relationship with gas sendout is covered in two feature articles. Laclede Gas Company and the Weather Corporation of America join in bringing this many-facet subject to you.

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OCT 19 1955

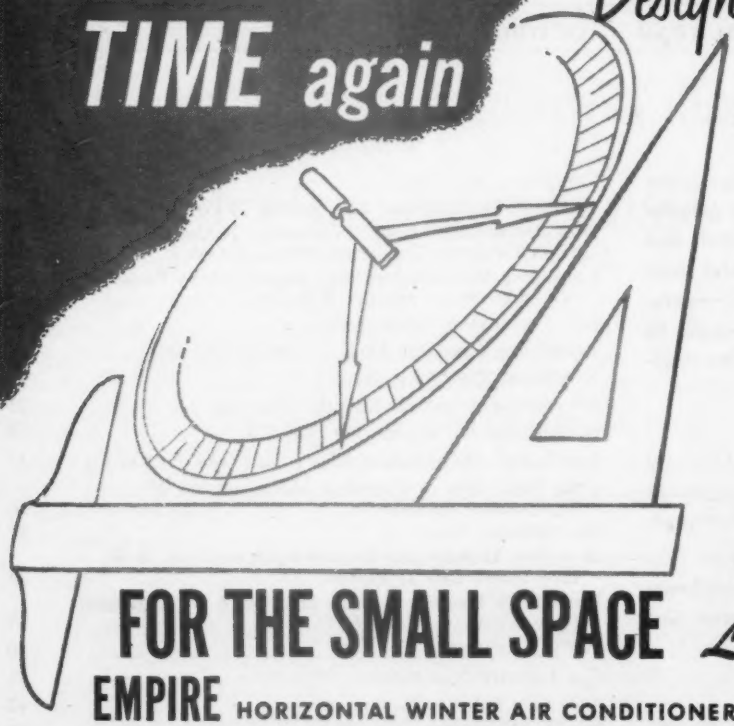
EMPIRE

TIME and TIME again

Designers find a better way

quality
style
service
economy

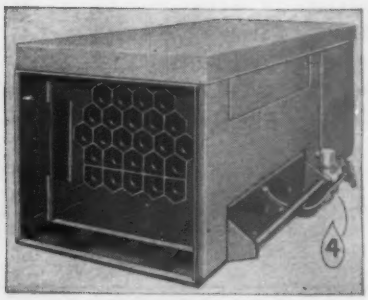
SELL THE MOST!
SELL THE LEADER!

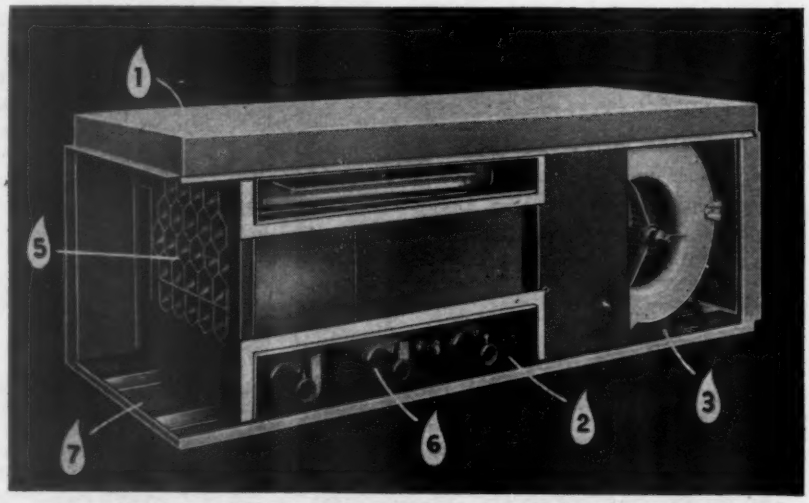


FOR THE SMALL SPACE

Less than 20" HIGH.

EMPIRE HORIZONTAL WINTER AIR CONDITIONERS ARE PARTICULARLY ADAPTABLE WHERE SPACE IS AT A PREMIUM.





1 HANDSOME CASING
2 COMPLETELY FACTORY ASSEMBLED AND WIRED
3 QUIET BLOWER
4 AUTOMATIC CONTROLS
5 LIFE-LONG HEAT EXCHANGER
6 PRECISION MANUFACTURED BURNERS
7 STURDY MOUNTINGS

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Empire a great name in Gas Appliances

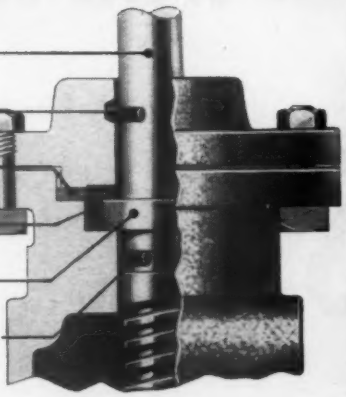
See your distributor or write direct to EMPIRE today.

STOVE COMPANY
BELLEVILLE, ILLINOIS

MUELLER

GATE VALVES

NO-BLO®



Gas-tight stem seals — Only Mueller Gate Valves have the exclusive "O" ring design that takes full advantage of the proven pressure-sealing effectiveness of "O" rings. Line pressure is sealed by an "O" ring located *below* the thrust collar. There is no line pressure acting on the gasket.

Result: Positive, leak-proof stem seals that seal tighter as pressure increases. No binding, no maintenance.

Easier turning — A second "O" ring, located above the thrust collar, serves as an effective dirt seal and gives an added advantage to the Mueller design. The space between the "O" rings and surrounding the thrust collar is filled with a special lubricant.

Result: An easier turning valve that is permanently lubricated to give longer life and low turning torque for years.

Now you can convert all Mueller Non-Rising Stem Gate Valves, 12" and under, to "O" ring stem packing. For details on this, and on the full line of Mueller Gate Valves, consult your Mueller Representative, Catalog G-97 or write direct.

MUELLER CO.

Dependable Since 1857

MAIN OFFICE & FACTORY DECATUR, ILLINOIS

MUELLER®

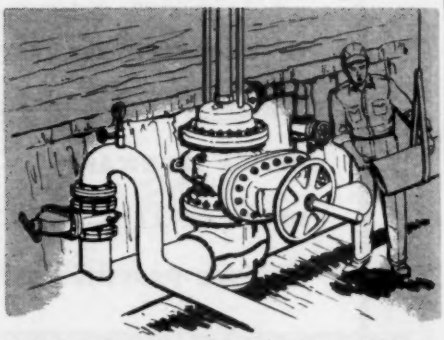
NO-BLO®

Method

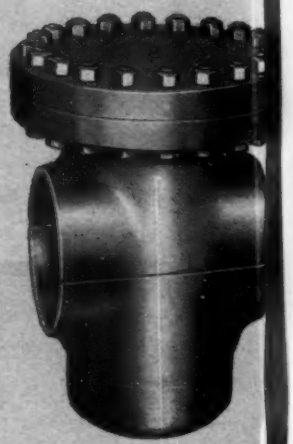
with the No. 4 Line

MAKES TIE-INS SAFELY...

STEP 1. WELD! LOOSEN PLUGS UNTIL NEOPRENE "O" RINGS CLEAR FITTING. WELD HALVES OF STOPPER FITTINGS TOGETHER AROUND PIPE. POSITION FITTINGS AND WELD TO PIPE. TEST. ALIGN MUELLER GATE VALVES ON FITTINGS AND BOLT SOLIDLY IN PLACE.



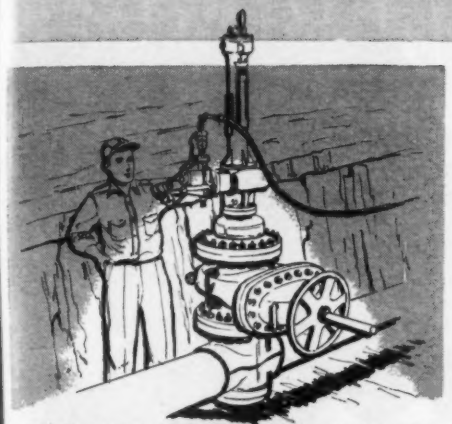
STEP 3. TIE-IN! ATTACH STEEL WEDGE STOPPERS TO OPERATING TUBE OF STOPPING MACHINE AND BOLT STOPPING MACHINES TO GATE VALVES. CONNECT BYPASS AND EQUALIZING LINES. LOWER STOPPERS INTO FITTINGS AND EXPAND TO ISOLATE SECTION. REMOVE SECTION AND MAKE TIE-IN.



H-17257 Welding Fitting

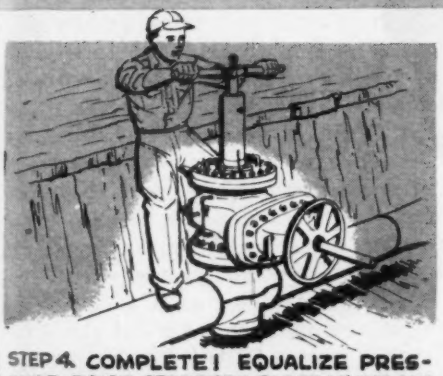
For use with 10" or 12" steel pipe. Furnished with "O" ring completion plug, completion cap and 400 pound flange.

This is another of a series showing the broad application of Mueller No-Blo Fittings and Machines used for their installation.

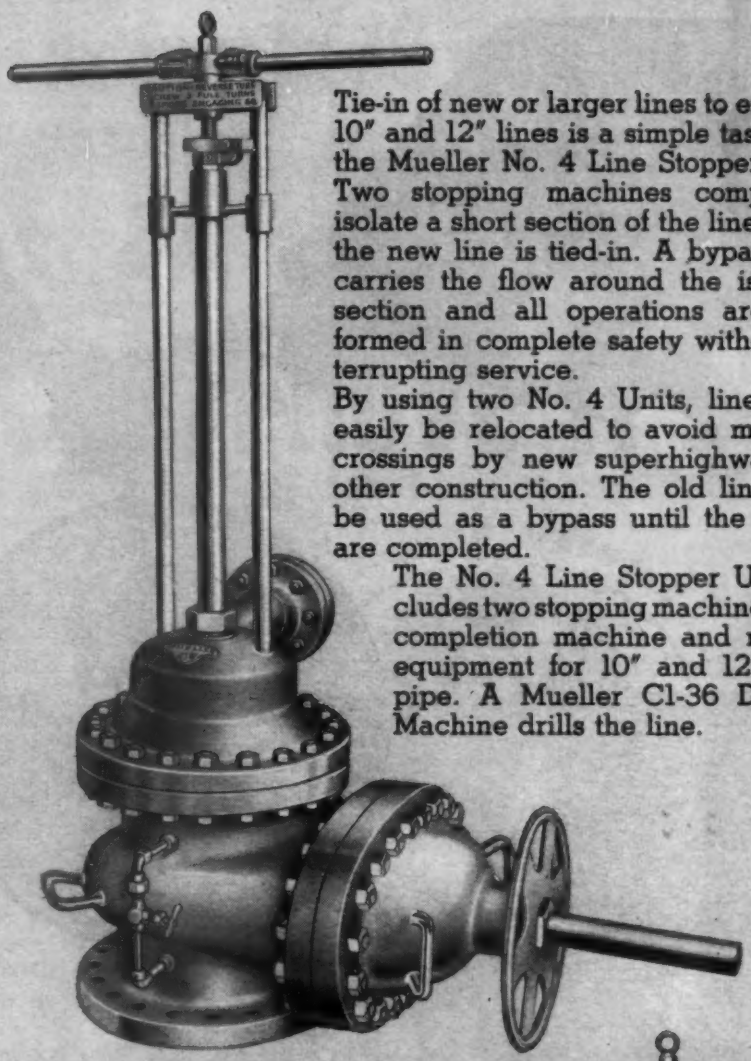


STEP 2. CUT! BOLT MUELLER C1-36 DRILLING MACHINE TO GATE VALVE AND MAKE CUT. WHEN FEED INDICATOR SHOWS CUT COMPLETED, RETRACT CUTTER - WHICH RETAINS COUPON - AND CLOSE VALVE. REMOVE DRILLING MACHINE.

Stopper Unit



STEP 4. COMPLETE! EQUALIZE PRESSURE, RAISE STOPPERS, CLOSE VALVE AND REMOVE MACHINES. FASTEN COMPLETION PLUG TO SHAFT OF COMPLETION MACHINE AND BOLT MACHINE TO GATE VALVE. OPEN VALVE AND SCREW PLUG TIGHTLY INTO FITTING. TEST. REMOVE MACHINE AND VALVE. BOLT CAP IN PLACE.



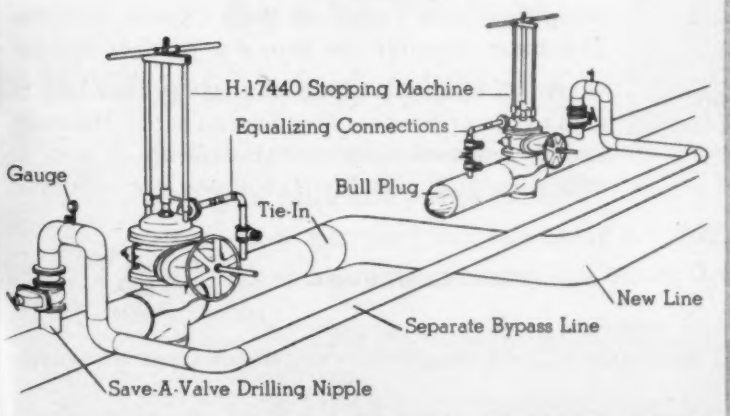
Tie-in of new or larger lines to existing 10" and 12" lines is a simple task with the Mueller No. 4 Line Stopper Unit. Two stopping machines completely isolate a short section of the line while the new line is tied-in. A bypass line carries the flow around the isolated section and all operations are performed in complete safety without interrupting service.

By using two No. 4 Units, lines may easily be relocated to avoid multiple crossings by new superhighways or other construction. The old line may be used as a bypass until the tie-ins are completed.

The No. 4 Line Stopper Unit includes two stopping machines, one completion machine and related equipment for 10" and 12" steel pipe. A Mueller C1-36 Drilling Machine drills the line.

H-17440 Stopping Machine with 4" flanged bypass connection. Maximum working pressure 500 p.s.i. at 100° Fahrenheit.
Maximum working temperature 250° Fahrenheit at 375 p.s.i.

H-17445 Completion Machine
Maximum working pressure 500 p.s.i. at 100° Fahrenheit.
Maximum working temperature 250° Fahrenheit at 470 p.s.i.



Set-up used to tie-in larger pipeline without interrupting service.

For complete specifications and details on the No. 4 Line Stopper Unit or other No-Blo Products, consult your Mueller Representative, Catalog G-97 or write direct.

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Dependable Since 1857

MAIN OFFICE & FACTORY DECATUR, ILLINOIS

Why tie up your money in communications equipment?

When you let the Bell System furnish your communications, you enjoy three important advantages:

1. *You avoid a large capital investment.*
2. *You don't have to worry about maintenance and obsolescence.*
3. *You get the benefits of trained personnel, expert supervision, continuing analysis.*

You don't tie up your money in communications equipment when you use Bell System facilities. This means you free this money to produce income.

A Bell System communications engineer will be glad to survey your communication needs. His study and recommendations are yours without cost or obligation. Call your Bell Telephone representative.

BELL TELEPHONE SYSTEM

TELEPHONE TELETYPEWRITER MOBILE RADIO TELEMETERING AND REMOTE CONTROL CHANNELS

JOHN WOOD Automatic GAS water heaters COST LESS TO OPERATE AND YOU CAN PROVE IT!

It's SAVINGS that make sales

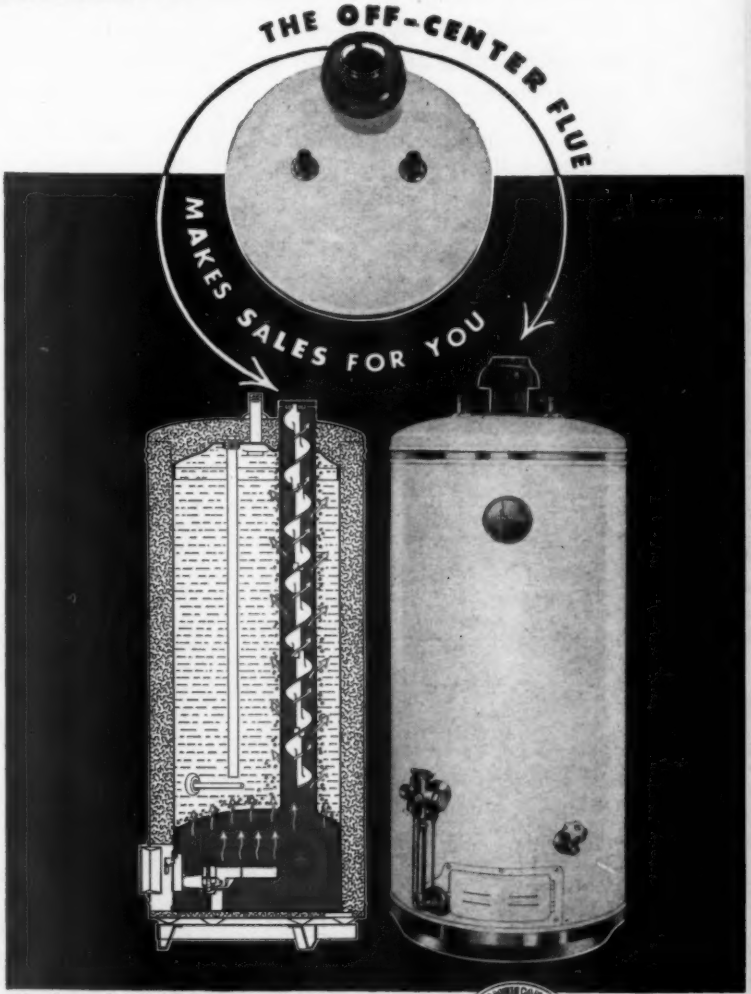
It's here—ready to work for you! JOHN WOOD has a water heater story that's a natural for sales! BY ACTUAL TEST, John Wood Water Heaters cost your customers less per gallon for hot water . . . make *savings no other construction can match!* That's because the OFF-CENTER flue construction—developed and featured by JOHN WOOD—beats every known water heater construction for economy in test after test.

That one fact gives you a real edge on all your competitors. Nobody has an economy story like yours when you feature JOHN WOOD. *Nobody* has the profit chances you get with the proved JOHN WOOD economy story!

Here's potent sales material—backed up by the hardest hitting program of promotion and advertising yet—*all working for you and your bigger profits.*

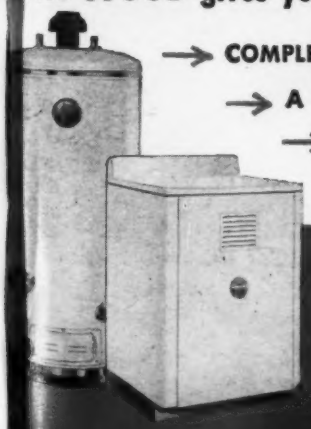
Ask your JOHN WOOD representative for the full story.

Write for FREE Book "How Do You Judge a Water Heater"—Today!



BEATS the rest by EVERY test

JOHN WOOD gives you more to build sales—



- → **COMPLETE LINE of sizes and styles, vertical and table top models**
- → **A PRICE FOR EVERY BUDGET**
- → **THE ONLY WATER HEATER OFFICIALLY SELECTED BY *Mrs. America***
- → **FULL PROMOTIONAL HELPS to build your sales**

JOHN WOOD SINCE 1857

Finest glass-lined or galvanized water heater anywhere!

JOHN WOOD COMPANY

HEATER AND TANK DIVISION

Conshohocken, Pennsylvania and Chicago, Illinois

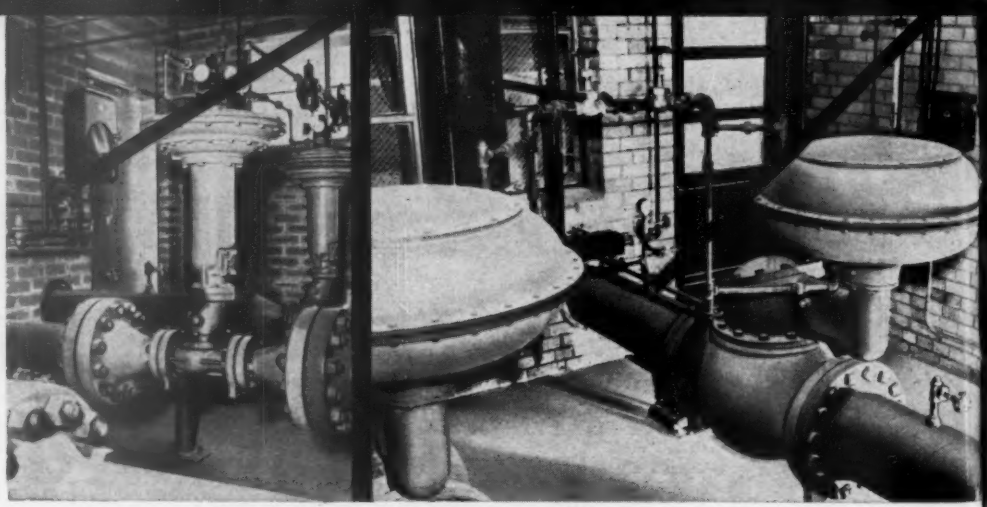
AMERICAN® METER

CONSUMERS' GAS COMPANY

From natural gas transmission line to consumers, American-Reliance precision measurement, regulation and control equipment serves the 165,000 gas users of greater Toronto.

American equipment has set the pace for nearly 120 years in design and development of gas metering, regulating and testing equipment. There is no substitute for the experience and comprehensive line American engineers can apply to your control and measurement problems.

The meter run at Toronto's new "City Gate". American Orifice Plates are housed in Robinson Fittings. Regulators and measuring equipment are in heated buildings.

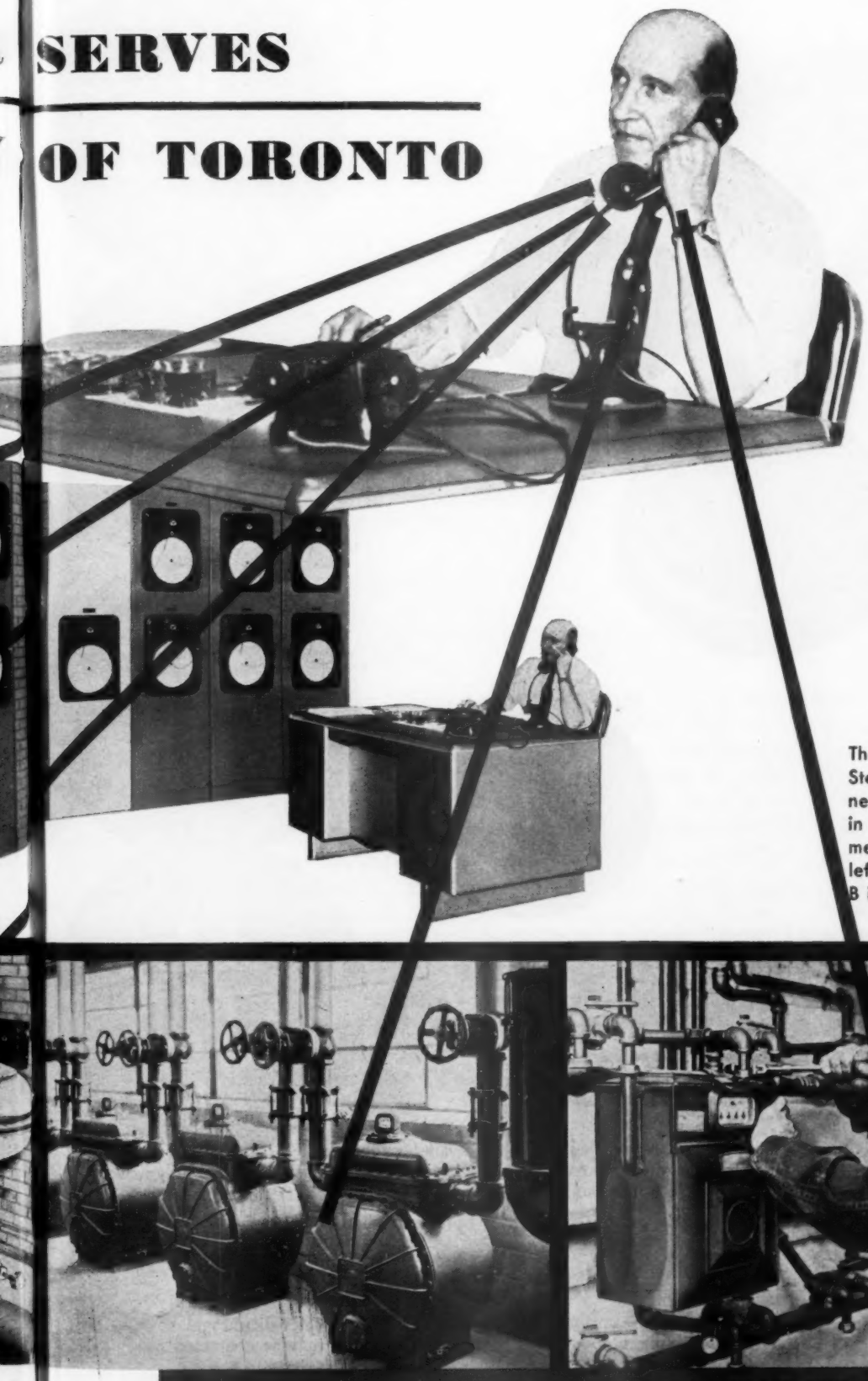


Reliance Type "P" and "CBVA" Regulators equipped with Moore Valve Positioners make the initial cut from transmission-line pressures to 200 psi at the "City Gate". American Series A-88 Controllers operate the Valve Positioners.

Two 12-inch pilot loaded Reliance "CBV 350" Regulators in parallel cut pressure from 20 psi to 3-15 inches at regulator stations. "ATC" Controller on one unit is remotely operated from the central dispatcher's office. Before this pressure cut, gas is measured through a 12-inch meter run and 10 inch-100 inch double integrating duplex orifice meter installation.

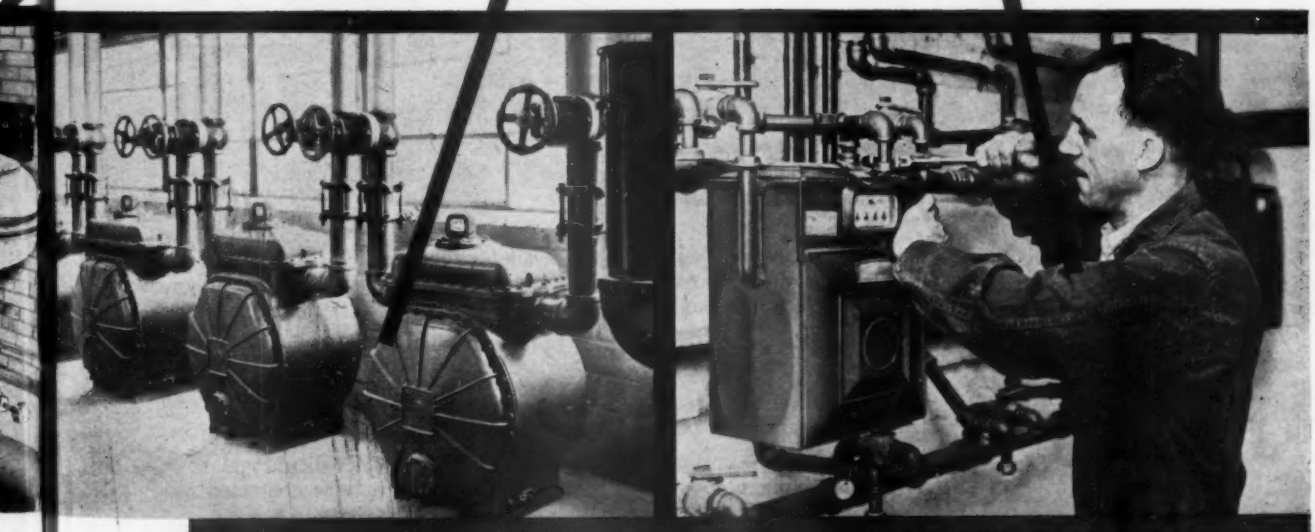
SERVES

OF TORONTO



Constant check on load for all parts of the system is Telemetered to central dispatch instrument panel. Pressures and flow are easily adjusted by the dispatcher through remote control to "City Gate" and regulator stations.

The first of a bank of Tinned Steelcase Meters goes into a new apartment house project in Toronto. Typical industrial metering installation (lower left) consists of American 500 B ironcase meters.



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METER COMPANY
INCORPORATED (ESTABLISHED 1836)

AMERICAN METER CO. EST. 1836 MEASUREMENT ENGINEERS

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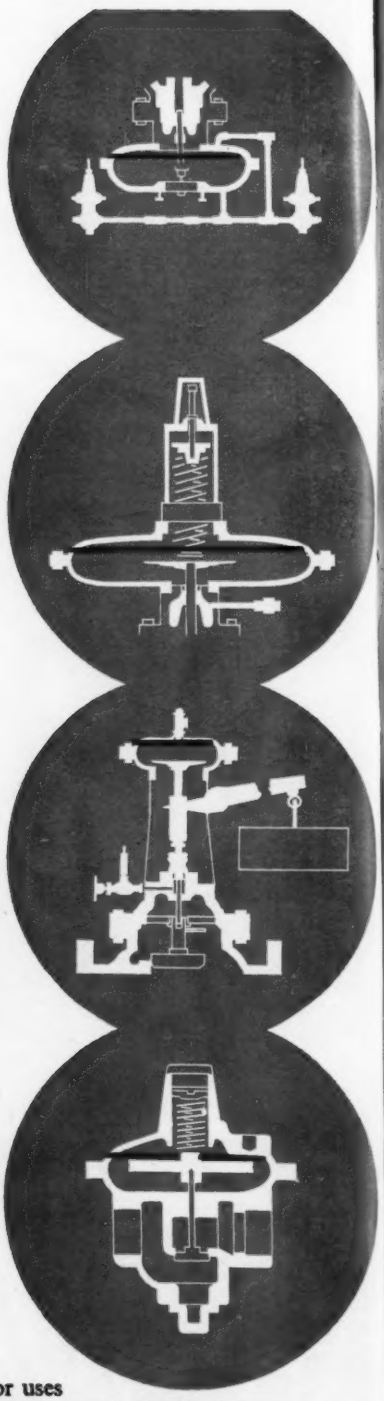


Regulator Diaphragms For Every Need

From high pressure and district to service and appliance regulators, the Vulcan Diaphragm maintains critical controls in ranges of pound to pound, pound to inches and inches to inches.

The strong, flexible, long wearing, high pressure diaphragms are available for uses under hundreds of pounds of pressure. At the other extreme, the thin super-sensitive appliance diaphragms operate dependably at differentials measured in fractions of inches w.c..

The performance of Vulcan Synthetic Diaphragms make them fully acceptable and completely dependable from field line to home appliance.

Another REEVES VULCAN RUBBER PRODUCT

Where the ultimate is required in fine controls, Vulcan Synthetic Diaphragms are specified.

For information regarding your gas regulator or gas meter diaphragm needs, any representative of Vulcan Rubber Products may be contacted without obligation.

REEVES BROTHERS, INC. • VULCAN RUBBER PRODUCTS DIVISION • 54 WORTH STREET, NEW YORK 13, N. Y.

me, too!

EDITORS, we have been told, are often viewed as characters, charged with all kinds of personal quirks that rouse ires or cause tolerant smiles and laughs. Happily, we do not know of a single reason to protest those charges for our highly respected gas industry counterparts or for ourselves. But, we wouldn't deny our own readiness to break with tradition, which we do here with real enthusiasm.

Literally and mechanically, another set of comments had been readied for this spot, *on the same subject,* but with the head, "Deliver Us — Anywhere — From Atlantic City."

Now, we break with tradition: Our good friend Bill Clark (or, as we note, William W. Clark), another gas industry editorial director, last month gasped, "Atlantic City? Not Again!" It's neither with irritation that Bill got on paper first, nor with any hesitation that we take the *me-too* position on that subject.

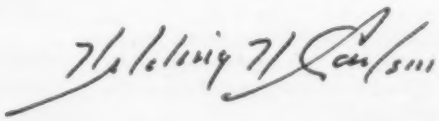
There is no doubt about the majority opinion of those American Gas Association members with whom we have spoken. Many of their expressions were strictly gratuitous; some were made in *that* city; some were most unprintable; few favorable opinions had enough enthusiasm to stand up under any degree of persuasion. Printable comments included: *walking . . . dampness . . . constant wind . . . Coney Island . . . Times Square . . . prices . . . distance unfair to western members.*

Now, Bill is a real Californian, and he might well have had tongue in cheek as he made a try for a more-western emphasis with his interesting and scathing comments on Atlantic City. But, as a native Jerseyite, we insist on personal privilege in taking a thoroughly dismal view of Atlantic City for AGA conventions — with or without exhibits.

When Gas Appliance Manufacturers Association reaffirmed its veto on an Atlantic City exhibit in 1956, it put coincidental emphasis on the trade shows that have high potential for getting gas appliances and equipment into trucks and freight cars — en route to the ultimate gas consumers. Certainly, it was a laudable decision to stop the high-cost talking-to-ourselves, which was just about the net of the AGA-GAMA exhibits.

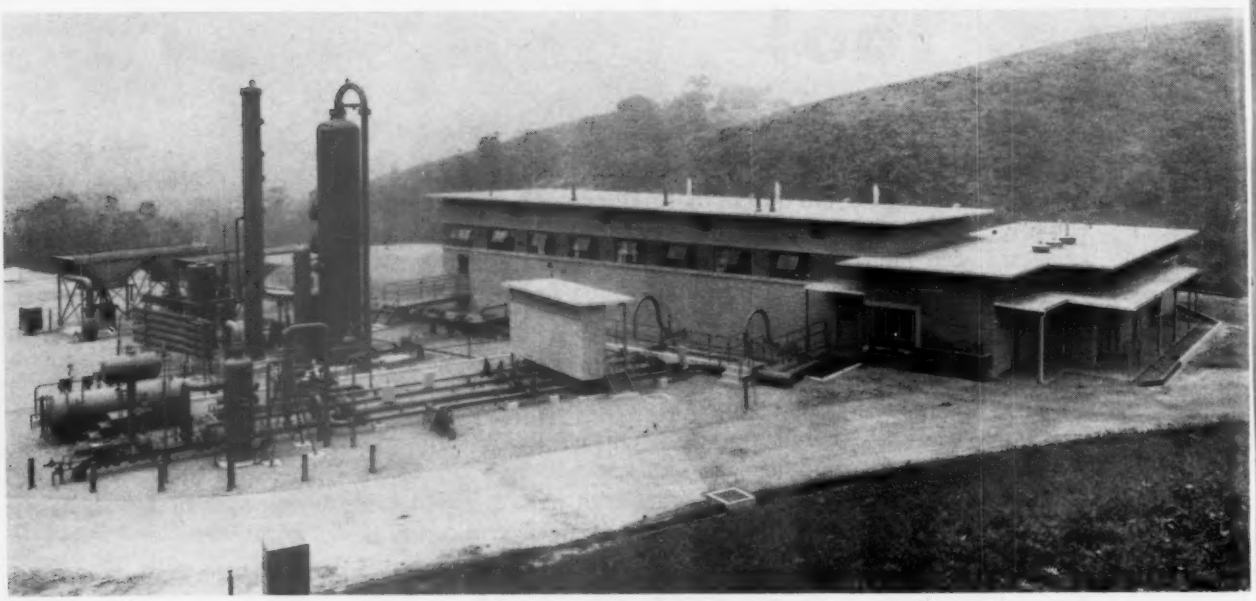
Of course, bias is clear at this point in the hope that the AGA executive committee will review and revise what amounts to policy in keeping Atlantic City on the schedule for 1958, 1960, 1962 or any other year.

An informal sampling of the membership will indicate the desirability of getting a broader expression of preferred convention cities.



Pacific Lighting Gas Supply proved that . . .

Suburban Underground Gas Storage Is Possible



General view — East Whittier, California, compressor station, Pacific Lighting Gas Supply Company.

FEATURE
American Gas Journal

. . . Consideration of property owners in plans and operations paid off

● Residential developments within the immediate vicinity of many depleted oil and gas fields have in the past eliminated consideration of these fields for storage operations as it was felt that such operations could not be carried on in the proximity of residential areas.

However, Raymond W. Todd, vice president and chief engineer, Pacific Lighting Gas Supply Company, told a Pacific Coast Gas Association group that approximately four years ago his company was successful in negotiating the purchase of a small oil and gas field located immediately adjacent to a residential area 20 miles east of Los Angeles, California.

This field was discovered in 1941 and produced substantial gas and oil over the next 10 years. By 1951 the gas was depleted and oil production had dropped below the economical limit.

Surface, storage and mineral rights were purchased for approximately 70 acres located on the near top of the reservoir zone.

Rights were also acquired to store gas in the reservoir underlying the surrounding 200 acres to be sure of controlling the entire reservoir.

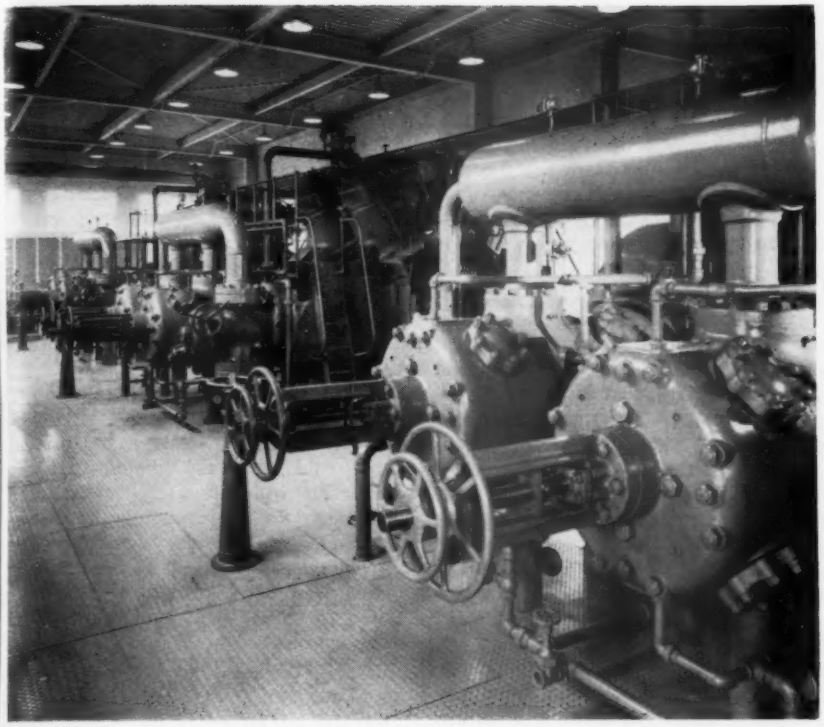
Pacific Lighting Gas Supply Company recognized that if the company expected to be able to operate such a field, it must conduct all developmental and subsequent operations in a manner that would not be objectionable to owners of surrounding residential property. The company immediately proceeded with a clean-up campaign, removing debris and junk. The area adjoined rolling hills with abundant brush and grass. Permission was obtained from the adjoining property owner to cut fire breaks across the hills, to protect the company's new property and the residential property.

Relations With Property Owners

Soon after the acquisition of the field, contact was made by the company with the local property owners association, and meetings were scheduled with the association's zoning committee to acquaint members with plans for the storage of natural gas. The meetings were held on the property so they could see the proposed location of the compressor station, the site being in as inconspicuous a place as possible, and to allow the company to outline its plans for landscaping the area surrounding the existing wells and station site area.

The approval of the property owners of the plans was not necessary, nor was it necessary for Pacific Lighting to obtain any zoning variance for its operations. However, the property owners association cooperated 100 per cent.

The property owners had developed a volunteer fire department, composed of residents in the immediate vicinity. A modest contribution to this organization not only assured Pacific Lighting of their cooperation, but also further



Interior view main compressor room containing three 440 horsepower compressor units.

evidenced the company's desire to become a part of the community.

Construction of compressor facilities and drilling injection and withdrawal wells would entail a large amount of heavy traffic on roads in the area that were normally carrying residential traffic. Inasmuch as there were several means of access to the storage field, a survey was made, and the company designated that access to and from the property should be by the route that would result in least traffic through the residential area. This route was posted so that persons traveling to or from the property could readily find their way without bothering the local residents for directions.

The heaviest traffic would occur in the early morning and late evening when residents were traveling to and from work. Therefore, Pacific Lighting specified in all construction contracts that no equipment, unless ordered in an emergency, could travel to or from the job site during these hours and that no heavy trucks or other noisy equipment could travel to the job site during night hours. All contractors have had to agree to comply with those restrictions. There has not been any complaint from contractors and none from property owners with regard to equipment traveling to and from the job.

Noise abatement

Several steps were taken to reduce the noise level to the lowest practical minimum.

First, all engines were equipped with the best residential-type mufflers available.

Second, main compressor buildings and auxiliary buildings were constructed with concrete block walls and flat steel roofs, covered with built-up surface coated with coarse aggregate.

Third, blow-down stacks for emergency blow-down of the plant or blow-downs of pipe systems were also equipped with mufflers.

Fourth, trees were planted along the sides of the compressor station site that adjoined residential property.

An investigation of various types of soundproof buildings indicated that this type of construction had the best sound-absorbing characteristics within practical construction costs.

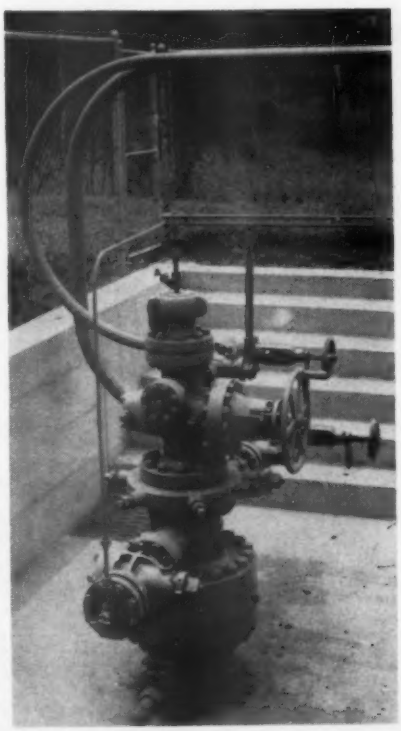
This tabulation gives some idea of the construction costs and sound-absorbing characteristics of the different styles of buildings considered:

Acoustic Quality and Cost of Building — Wall Types.

(100 to 120 decibel on interior)

Type of wall	Sound Transmission (Loss in Decibels)	Interior Noise (Reduction Coefficient)	Construction Cost Per Sq Ft of Wall Area
8-in. concrete block with filled cells	55.00	0	$1.10
Corrugated transite on steel frame with 2-in. Insulrock	20.00	0.80	$1.22
Rockwool batt in 3¼-in. "Q-panel" with 1¼-in. Acousti-Celotex on 1-in. x 3-in furring	61.60	0.75	$1.32
8-in. concrete (poured)	55.00	0	$1.33
2-in. steel studs staggered and laced with 1-in. rockwool between two ⅝-in. plaster panels	55.70	0	$1.45

Christmas tree piping of Fullerton Well No. 6, East Whittier, California, compressor station.



It was necessary also to give consideration to the noise problem in drilling additional injection and withdrawal wells. Here, the company followed generally accepted well drilling practices with the exception that the rigs were completely insulated with glass fibre mats that practically eliminated all noise.

Plant appearance

Plans for the main compressor building and auxiliary building were along modernistic lines. The flat, extended roof, the concrete block construction with horizontal mortar joint emphasized, along with a horizontal window pattern, all combined to give a low-appearing building, which blended with the extended covered passageways along the office part of the auxiliary building to give a very good appearance.

Facilities in the plant were located so that mufflers and air cleaners were away from residential development.

An industrial color consultant worked out a color scheme of light tans and shades of green for the building and all exterior piping. This color scheme has proved very acceptable.

The same general color scheme was used inside the station building.

Employees working around the new color scheme find that the elimination of aluminum paint on the outside facilities is easier on their eyes, and they state that working conditions have been materially improved by the use of the new color scheme.

Landscaping consultants set plants in the vicinity of the compressor station building and around each of the wells. Protective growth around the wells was suggested by the fire department to eliminate weeds and brush, which would produce a fire hazard. The use of ice plant in these areas has not only proved to be very attractive but has eliminated this fire hazard.

Design of facilities

The design of the compressor station facilities in general followed modern-day plant design. All facilities installed were designed in accordance with ASA B 31.1 code provisions and were sized to meet anticipated capacities. The first group of compressor units included three 440-hp Cooper-Bessemer GMV-4 units. This size unit was selected to meet fluctuating loads that might be incurred in injecting gas. Auxiliary facilities include generating facilities for plant and field use. Three high-speed, gas-engine driven 125-kva generator units are used. All service functions in connection with operations at East Whittier are electric-motor driven, to eliminate as many gas engine units as possible. This was desirable in line with the policy of keeping total noise level to a minimum. Generating equipment was considered essential, inasmuch as the field operations could be nullified by an outside power failure.

Field operation

Plant facilities were designed to operate at pressures up to 1200 psi, although to date the maximum wellhead pressure in the field has been 730 psi, or appoximately the original discovery pressure.

As the field is developed, it is anticipated that the maximum storage pressure will be increased gradually to approximately 900 psi.

Withdrawal gas is delivered at approximately 250 psi without compression.

Inasmuch as this field has been operated as a gas storage reservoir for approximately two years, a definite pattern of operating characteristics has not been established. However, the injection of gas and the resulting re-establishment of pressure in the storage zone has resulted in displacement of a certain amount of water. Proof of this comes from increased pressure in wells that were completed in the wet zone. These wells at the start of storage operations showed no pressure, whereas since the re-establishment of pressure in the zone, the wells have shown a definite build-up of several hundred pounds.

The ultimate working capacity of the reservoir cannot be definitely established. At present, there is an indication that the reservoir has a working capacity of 1.4 billion cu ft. To date, injection has an accumulative total of approximately 1750 MMcf, while withdrawals total 1145 MMcf. Withdrawal capacity is being stepped up to 50 MMcf per day.

In view of the strategic location of this field, it is anticipated that the reservoir will ultimately be operated in much the same manner as above-ground gas holders. The reservoir probably will not only be used to help equate annual loads but will also be used to equate daily and hourly load fluctuations.

As a result of the success of Pacific Lighting Gas Supply Company in being able to operate this field in a satisfactory manner and without serious objections from the surrounding property owners, Todd says the company is giving serious consideration to the development of gas storage in other fields that are close to residential areas. ★

Natural Gas Common Stock Prices Reach New High

The price index of natural gas common stocks reached a new peak as of August 26, 1955, the American Gas Association reports. The composite price of the common stocks for the companies comprising the index was 13.6 per cent greater than on the comparable day one year prior and was 30.9 per cent higher than the lowest price occurring in the 1954-1955 period. Dividend increases of only 4.5 per cent on these stocks, however, resulted in yields declining from 4.80 to 4.42 per cent, a relative decline of 7.9 per cent over the year.

Price of the ten gas transmission company stocks increased 20.1 per cent over the comparable period of last year, while the price of the ten gas distribution utility stocks increased 13.7 per cent. Accompanying these price changes were increased dividend payments of 3.3 and 13.2 for the transmission and distribution components of the index. Because of the larger relative increase in prices than in dividend payments for these common stocks, yields declined 13.7 and 0.4 per cent for transmission and distribution companies, respectively. The yield on transmission company stocks declined from 4.66 per cent on August 27, 1954, to 4.02 per cent as of August 26, 1955. Yields on distribution company stocks declined from 4.83 to 4.81 per cent over the same period of time.

The following table lists stock prices, dividends and yields for ten transmission companies, ten distribution companies and a composite group consisting of thirty companies, including the above two groups and ten integrated systems having both transmission and distribution facilities. A full description of the component parts of the index will be given on request by the American Gas Association.

Natural gas company stock prices, dividends and yields

	1955				1954	Ranges 1955–1954
	Aug. 26	Aug. 19	Aug. 12	Aug. 5	Aug. 27	High-Low
10 Gas Transmission Common Stocks						
Price ($ per share)	46.32	45.18	44.25	44.57	38.58	46.32–34.09
Dividend ($ per share)	1.86	1.86	1.86	1.86	1.80	1.86– 1.68
Yield (%)	4.02	4.12	4.20	4.17	4.66	4.93– 3.93
10 Gas Distribution Common Stocks						
Price ($ per share)	28.46	28.53	28.43	28.18	25.04	28.53–21.46
Dividend ($ per share)	1.37	1.37	1.37	1.32	1.21	1.37– 1.15
Yield (%)	4.81	4.80	4.82	4.68	4.83	5.36– 4.48
30 Natural Gas Common Stocks*						
Price ($ per share)	37.14	3 .73	36.25	36.26	32.68	37.14–28.37
Dividend ($ per share)	1.64	1.64	1.64	1.62	1.57	1.64– 1.49
Yield (%)	4.42	4.47	4.52	4.47	4.80	5.22– 4.29

* Includes 20 gas transmission and distribution stocks included above, plus stocks of 10 integrated companies.

How Specialized Weather Forecasting Is Used for High-Efficiency Gas Dispatching

Edwin F. Trunk

● CERTAINLY, the fact that gas sendout and the weather are closely related has been well established for any company with space heating load. This is true even though the number of space heating customers is relatively small compared to the total number of customers. The most widely used relationship is, of course, the relationship between gas sendout and degree days.

Degree days, however, reflect only one facet of the weather picture; namely, the average daily temperature. Even though this facet may be the major one affecting the sendout, sole use of it to forecast sendout has several disadvantages. Two days having the same average daily temperature may have widely differing temperature distribution patterns, with consequent widely differing sendouts. If degree days only are used, sendout forecasts for these days should be the same. It is also fairly well established that other facets of the weather such as wind, sunlight, precipitation and others also exert their influence on the gas sendout. How should they be evaluated?

Prior to 1949 when Laclede Gas Company served the St. Louis, Missouri, area with mixed gas, conditions were such that the accuracy of sendout forecasts were critical only on very cold days. Peak shaving was required only when average daily temperatures were lower than 5 F. In this range, the relative importance of the temperature far outweighed the other factors. This fact, together with the rarity of occurrence in this area, enabled us to do a fairly satisfactory job of sendout forecasting by using the average daily temperature and a rule of thumb adjustment for wind velocities greater than 15 mph.

Following conversion to straight natural gas distribution in 1949, we entered a period of very rapid increase in load due to our ability to take additional space heating business. This increase in load, together with changes in our contract for natural gas, had the affect of shifting our critical period of sendout forecasting further and further into the warmer portions of the weather spectrum. The other weather factors mentioned now began to exert an influence that could no longer be neglected. It became mandatory that we find a method to evaluate them.

Realizing that varying patterns of hourly temperatures and wind velocities, producing widely different daily sendouts, could have the same daily average, caused us to divide our day into four six-hour periods. We concluded that we should make separate forecasts for each period rather than one forecast for the whole day. Our next step was to evaluate the relative importance of the various weather phenomena.

Since the portion of our load that varied with the weather was made up almost entirely of space heating load, we concluded that the factors that affect the heat loss from a building would have the same relative affect on our load. We, therefore, set down the general equation for the heat loss from a typical residence in our service area. All terms of the equation were then rewritten so that the independent variable was expressed in weather terms such as outdoor temperature and wind velocity. We were then able to combine terms and end up with an equation showing the relative importance of various weather phenomena. After discarding all terms of minor importance, we had three left and, in order of importance, they were atmospheric temperature, wind velocity and amount of sunlight.

The next step was to find an equation defining the relation between the sendout for each of our six-hour periods and the weather factors evaluated. By using actual data for several past winter seasons and employing the Law of Least Squares, we derived a set of linear equations giving us the best mathematical fit for each period for different days of the week. To give proper effect to customer habits and activities, we grouped the various days of the week and derived equations for each group. Mondays, Tuesdays, Wednesdays and Thursdays are in one group, Fridays in another group; Sundays and holidays in a third group; Saturdays are grouped with days preceding holidays, such as Thanksgiving, Christmas and New Year's.

When we tried to use these equations, we found that we had good results in two of the six-hour periods, but in the two others we were able to achieve results no better than we obtained in trying to make one forecast for the whole day. We concluded that the division of the day into four equal six-hour periods was faulty and would bear further investigation.

Characteristic Curve Evolves

By plotting hourly load curves so that the hourly sendout was shown in percentage of the total day, we obtained a characteristic shape for days of similar temperature distribution even though the average daily temperatures were quite different. While the relation between peaks and valleys varied for days of different weather patterns, we found that the points of inflection came at nearly the same time of day in each case.

The accompanying chart is a typical example of such a load curve. This led us to conclude that the daily sendout was a composite of four curves, covering periods of unequal length as indicated by the chart. By a slight shift, we brought the starting time of these periods into line with weather forecast timing. The night period was further divided into two periods, since the day of the week has a pronounced affect on the sendout pattern after 3 a.m. The morning period had to be divided at 7 a.m., since this is the beginning of our fiscal day.

We finally came out with these forecasting periods for our fiscal day:

1st Period—7 a.m. to 9 a.m.—2 hours
2nd Period—9 a.m. to 1 p.m.—4 hours
3rd Period—1 p.m. to 5 p.m.—4 hours
4th Period—5 p.m. to 9 p.m.—4 hours
5th Period—9 p.m. to 3 a.m.—6 hours
6th period—3 a.m. to 7 a.m.—4 hours

We restudied several past seasons and worked out new equations for correlation of sendout to weather data for the six periods mentioned. We found much better correlation. While still a long way from perfect, our experience during the past two winters has been such that we feel we have a much better tool for load forecasting than any of our previous methods.

We were considerably heartened

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The Author

Edwin F. Trunk is a graduate of the University of Missouri with a BS in mechanical engineering. He joined Laclede Gas Company in 1925 as junior engineer. He has worked chiefly on water gas plant design and operation and special engineering and economic studies involving over-all operations of the company. He began a study of distribution system analysis in 1939. Trunk was appointed chief engineer in June, 1955.

when, during the course of our correlation development work, we learned about the work that Coast Counties Gas Company was doing in California. The company took the direct field approach to the same problem. By making simultaneous observations of weather data and gas consumption measurements in a section of its service area, the company developed equations of correlation containing the same weather factors and in the same relative magnitude of importance as we did.

Suitable Forecasts Were Problem

Having obtained what we felt to be good correlation between gas sendout and actual past weather conditions, the equations then had to be adjusted for use in making sendout forecasts for future load. This meant that they had to be trended upward to give consideration to the increase in number of customers as well as the increase in use per customer. Another factor of vital importance then comes into the picture in order to enable us to make effective use of our equations for load forecasting. This is the problem of securing weather forecasts suitable for the purpose.

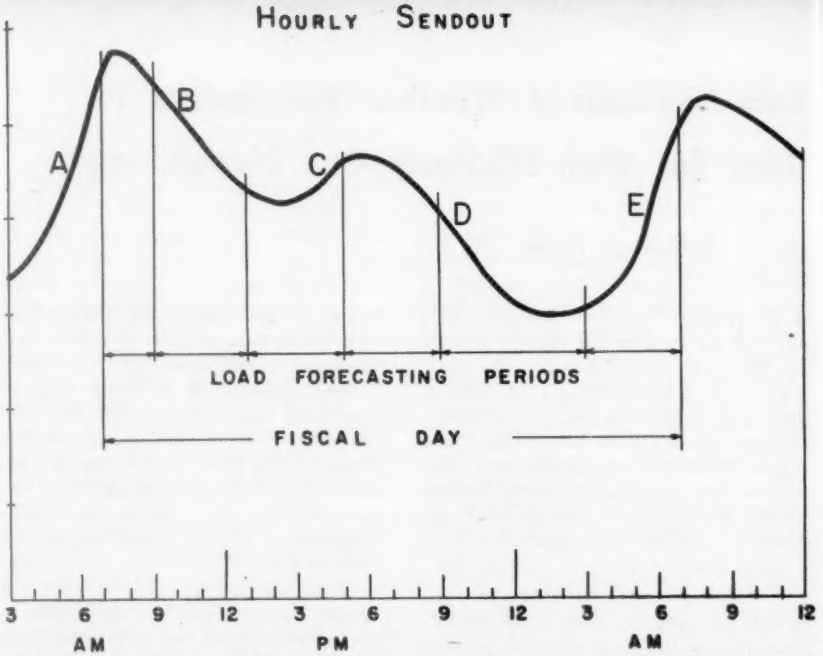
Even prior to 1949, when we used only the average or mean daily temperature and average daily wind velocity, we found that we needed something better than the U. S. Weather Bureau's generalized forecast of maximum and minimum daily temperatures. We needed more frequent revisions during the day, particularly in cases of unexpected changes in the speed of frontal movements.

Trial use of the services of a private weather forecasting concern, Weather Corporation of America, soon convinced us that we could do a better load forecasting job than we could by relying on the published reports of the local U. S. Weather Bureau office.

Later, when we had developed our equations and had need for forecasts of average temperatures and wind velocities for specific periods of the day, Weather Corporation was in a position to furnish them. By close liason between its staff and ours, this company learned just what weather conditions are critical to us. By watching for these particular conditions around the clock the company can, and does, give us immediate warning. This gives us the maximum amount of time to adjust our operating plans and procedures for handling interruptible load and peak shaving plants.

Forecasting Cycle for 24 Hours

At present, we receive a weather forecast at 6 a.m. giving detailed temperature averages and wind velocities for each of our six forecasting periods for the current day and the succeeding



Characteristic hourly sendout curve for typical winter week day. Characteristic curves for other weather patterns differ in amplitude of peaks and valleys, the points of inflection indicated by A, B, C, D and E occurred at approximately the same times of day. By dividing the day into sections indicated by these letters for correlation with weather data, proper recognition is given to customer habits and activities during the day.

day. Effective amount of sunlight for the daylight hours is also given for both days. In addition, we get a summary of weather expectations for the next 72 hr.

This forecast is based on the weather map drawn from the 12:30 a.m. synoptic chart data revised in accordance with the latest hourly reports received over the Airways Teletype circuit. This forecast enables us to formulate our plans for handling our fiscal day, starting at 7 a.m. By 8 a.m. we have a completed forecast based on a new weather map drawn from the 6:30 a.m. synoptic chart data. This is also a complete detailed forecast for a 72-hr period.

At 12:30 p.m., the next set of synoptic chart data plus the upper air data starts coming in over the teletype. A new map is drawn and a revised forecast phoned to us by 3 p.m. This revision covers the balance of the current day and all of the next day. This forecast is again revised at 9 p.m. after receipt of the synoptic chart data as of 6:30 p.m. At 3 a.m., we receive another revision that is based on the 12:30 a.m. data. This again includes reports of upper air conditions as of 12:30 a.m. Then at 6 a.m., the daily cycle starts over again.

If we should be in a spell of weather in which certain conditions are critical for us, Weather Corporation uses the hourly reports from the Airways circuit to prepare revisions of the weather map at three-hr intervals. It is rarely necessary that maps at three-hr intervals are required for the whole day. Sometimes, however, the exact timing of an expected sharp drop in temperature may be required for proper peak shaving operations. If such is the case, and there is any irregularity in the cold-front movement, the three-hr maps are prepared.

Other Departments Use Service

The main purpose of continually revising weather forecasts is, of course, to permit us to revise our operating procedure as the day progresses. By this means, we can keep narrowing the brackets on our principal target for the day; namely, the natural gas take from the pipe line.

We have also learned to make good use of this special weather forecasting service in other departments of our company. Use by Weather Corporation of the facsimile service from Washington, D. C., gives its staff a better basis for judging the length and severity of cold outbreaks during the winter season. This information is of value in scheduling shipments of our propane and gas oil requirements. Thus, by giving some extra attention to such conditions as thunderstorms, rain, sleet, snow and icy streets, the company furnishes special forecasts twice daily to the construction department and the transportation department.

These forecasts are timed to reach these departments for proper planning of their activities. For instance, if snow or sleet is expected during the early morning hours, the forecast reaches the transportation department in time to hold the night crew over to install skid chains. In this way, the fleet is ready to go at the start of the working day.

Consulting Meteorologists Must Regard Utility Problems as Their Own

Armand R. Iaccheo
Weather Corporation of America

The science of meteorology has too long been mysterious, understood by few and applied by fewer.

There are two facets to be considered in creating a wider application of weather knowledge. First, education on just how the final product — weather forecast—is made. That will show that weather forecasting is truly a science. Next, the meteorologist must descend from his ivory tower of physical laws and mathematical equations to understand the practical problems of industry. He must devise means whereby industry can make use of the science.

The very essence of applying technical knowledge to practical industry problems is to understand those problems thoroughly, to work closely with the industry and then to apply the tools that science has provided.

The operations offices of private weather consulting firms are equipped with specialized instruments and equipment, such as teletype writers, weather map boards and facsimile weather map receivers.

Throughout the world, several hundred weather stations are manned 24 hr per day, all year. Every hour, most stations are responsible for making weather observations. They measure such conditions as surface temperatures, humidity, winds, atmospheric pressure, sky cover and cloud classifications.

These observations are made by the weather bureaus, air forces, navies and merchant vessels of almost every country in the world. A large number of these stations make other observations of conditions aloft, by balloon-carried, weather-sensitive radio equipment.

All this information is then put into an international code and transmitted to collection centers throughout the world, from which points it is received and retransmitted over United States weather teletype circuits. Reports from stations throughout the United States are received every hour by the private meteorologist. He receives reports from other North American weather stations and ships at sea every 6 hr, together with vast amounts of upper-air data.

When the forecaster has received all present weather data, he must put it into form that will enable him to prepare a forecast of conditions to come.

These data are plotted on maps, and then the meteorologist analyzes them to determine the locations of high and low-pressure areas and the boundaries of cold and warm air masses. He receives further supplementary charts over the facsimile network from Washington, D. C. In all, the forecaster works with more than 50 weather maps a day.

Since the atmosphere is composed of gases, acting as any other fluid, it would seem that with the wealth of information available, the professional meteorologist's job should be relatively simple. These gases, however, are influenced by the sun's variable heat over the surface of the earth, causing variations in density and thereby turbulent vertical movement of the atmosphere. Also, effects are created by the earth's motion and other influences.

Using the various laws of motion, thermodynamics and other physical laws, blended with a knowledge of local climatology and statistics, the forecaster computes air-mass movements, modifications of the air masses and the varied horizontal and vertical effects causing cloud formations. From this evolves the weather forecast.

The meteorologist has often been criticized, and rightfully so, for lack of clarity and ability to confuse. The industrial weather man must be flexible. He must know his science thoroughly, but—at the same time—he must be able to translate this knowledge into language that can be applied properly.

The private meteorologist 10 years ago was a pioneer in a new field of applied science. However, so were the gas company engineer, dispatcher and executive who realized the potentialities of direct application of weather knowledge to gas operations.

From such men, the meteorologist learned some of the problems of the gas engineer and dispatcher. In working with them it became apparent that it was not sufficient to understand just general problems. It was essential to analyze thoroughly and become acquainted with the details and peculiarities of each individual company.

Weather services to gas companies required improved forecasting accuracy and an understanding of all factors that affect daily sendout and long-range planning. It was necessary to learn the full importance of strong winds and heavy clouds on sendout . . . the steps and alternatives of the dispatcher on peak days . . . holder recovery problems . . . problems in balancing natural gas usage within pipe line contract limitations.

A common understanding was developed between dispatcher and forecaster, whereby the weatherman was just as critically concerned with the problems of industrial curtailment and LP gas plant operations as the dispatcher himself.

The general problems of most companies coincided, but seldom were their critical limits or specific countermeasures similar. Phone or teletype discussions between meteorologist and dispatcher or engineer are now on a common plane of understanding. Accordingly, specific forecasts of temperature variation throughout the gas day are routine.

Each company is regarded individually as forecasters deal with their problems. Gas dispatchers now have a coordinated staff of experienced meteorologists on whom they rely for directly applicable data, in the manner described by E. F. Trunk in this issue.

This consulting meteorologist's office is equipped with the facilities necessary to reduce continual flow of incoming weather data requirements of individual gas utilities. Forecasters are on duty throughout the day and night.

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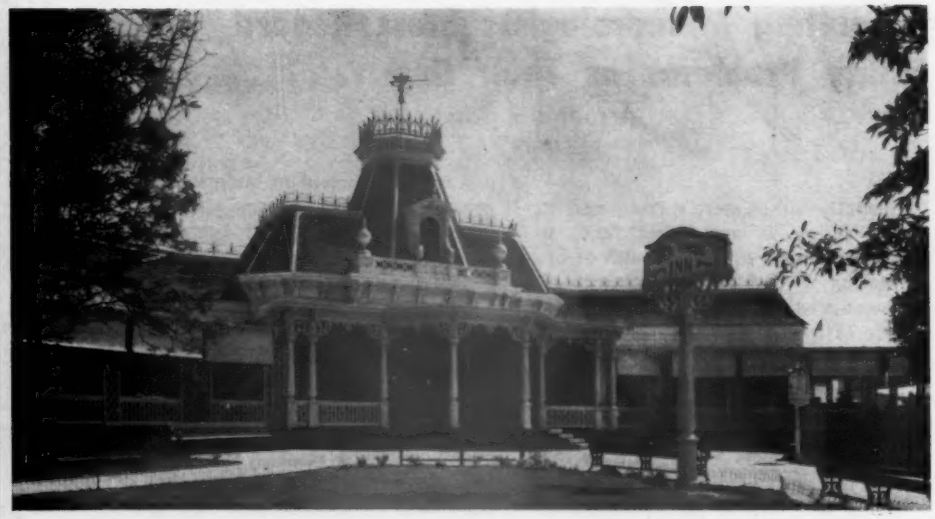
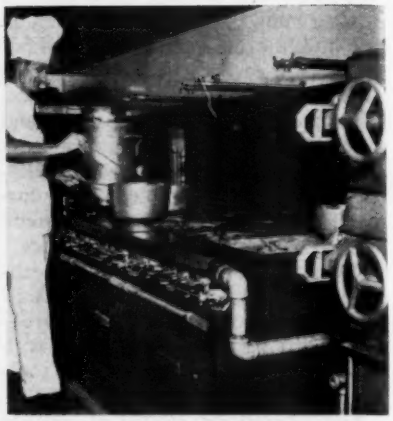


Disneyland's Red Wagon Inn features complete luncheon and dinner menus patterned after such models as Delmonico's in New York. Kitchen is gas equipped.



Chef Daniel R. Terry of Disneyland's Pavilion restaurant works with completely gas-fired equipment.

Gas Featured in Disneyland

● As wondrous as the make-believe of Disneyland is, the ubiquitous behind-the-scenes efficiency of gas — even amidst the hectic atmosphere of a giant amusement park — was never better demonstrated than it is each day in Walt Disney's Anaheim, California, dream world.

Natural gas is not always behind the scenes. One of the first sights that has greeted more than 20,000 visitors each day since the opening on July 18 has been Main Street, U.S.A., a reproduction of turn-of-the-century days, which is studded with gas lights.

Another, and more unusual, role for natural gas in the park is its use in conjunction with the freight train, the scaled-down version of an old-time cap-stack "iron horse," which takes off from Frontierland for a passenger-laden ride around the perimeter of the entire grounds. The train is drawn by a diesel-fired steam engine, and natural gas is used every morning to fire the engine for the day's first run.

But natural gas' most predominant role is its use as a fuel for cooking, heating and maintenance of the many vital functions of Disneyland.

There are 20 restaurants, sandwich counters and specialty houses that offer food to visitors. And natural gas serves them predominantly.

So predominantly, in fact, that in the first full month — August 2 to September 1 — two large Southern Counties Gas Company meters an Emco 5 and a Metric 80-B registered 1,036,000 cu ft of natural gas consumed in Disneyland. They serve the miles of lines that lie under almost all the 160-acre park.

Officials of Southern Counties, which serves Disneyland as one of its more than 490,000 consumers, estimate its gas consumption during August would have been enough to satisfy one day's needs of all general service customers in a town such as Culver City, California.

Not all Disneyland restaurants are open for business at this time; some are still being fitted out.

An estimated $50,000 has been invested in commercial gas cooking equipment in Disneyland.

Restaurants now open using gas equipment include two in Fantasyland, one on Frontierland, Aunt Jemima, the Plantation, the Space Bar, the Yacht Club, the Puffin Bake Shop, the Red Wagon and the Pavilion.

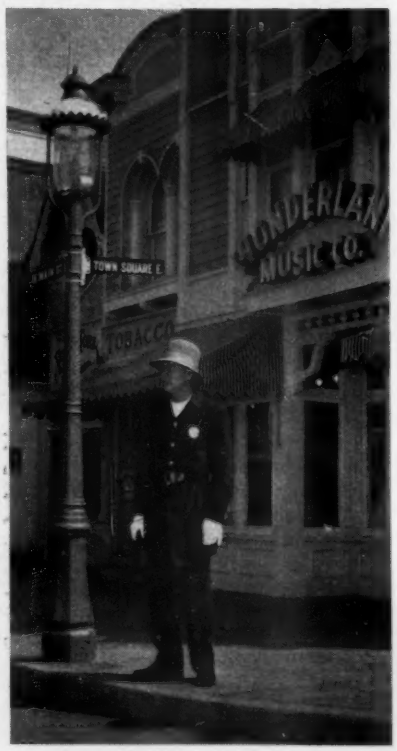
The Red Wagon and the Pavilion both front on the Plaza, which is the hub of the four "lands." The Red Wagon is a re-creation of the Gay Nineties restaurant, typified by Delmonico's in Old New York. The Pavilion, also known as the Buffeteria, is a new concept in food service, combining the better features of buffet, cafeteria and restaurant.

Among them, these restaurants use equipment that is representative of nearly all manufacturers of commercial gas-cooking equipment.

In addition, space and water-heating equipment throughout Disneyland is predominantly gas-fired. * * *

First month tops 1000 MCF

"Long-ago" street features a Gay Nineties cop strolling his beat down the nostalgia-creating Main Street, U. S. A., under rows of gas lamps. Lamps are lighted nightly by old-fashioned lamplighter.



Don Cunningham, assistant to the controller of Southern Counties Gas Company examines part of the new punchcard tabulating equipment installed in the company's Los Angeles offices.

Jerrold Q. Abel

Accounting Goes Mechanical

Southern Counties Gas Employs Punchcard System

● Should we mechanize?

In 1954, faced with continuing and accelerating growth that made our accounting and billing methods used prior to 1925 as obsolete as the "Boston Ledgers," the question could no longer be put off.

While we had a rather good idea that mechanization was the answer to a steadily mounting work load occasioned by the 130 per cent meter increase in 10 years, we proceeded slowly and carefully.

A management consulting firm was engaged to study our operations to see if the information we had gathered would stand up under qualified and critical review. The results of both studies were the same: Go to mechanized equipment as rapidly as possible.

Once we had decided on the move, it became a question of whether, while making the changeover, we should go all the way to electronic data processing.

Again, we worked with the management consulting firm and, in addition, discussed the problem with a well-known research organization. Both outside agencies approved our proposed plan, which was to install punchcard tabulating equipment and, for a while at least, forget about the electronic equipment.

Our reasons for this, briefly stated, were: (1) Electronic equipment for industry, we were told, is yet in the development stage, and (2) by adopting punchcard equipment, "we would be better prepared for another change when the time came.

Our preparation for the impending move had just begun. We knew that the change-over would affect a lot of our employees and that there would be worried questions about "layoffs" and automation.

So, Guy W. Wadsworth Jr., president and general manager, George S. Coates, manager, customers department, and I went into the operating areas of our eight divisions and explained the move to employees who would be affected by the change. We told them that none of the company's regular employees at the time of the changeover would be laid off because of it. Employees were told that some minor reassignments undoubtedly would have to be expected but such shifts would be limited to the area in which the people worked at that time.

Our groundwork was laid.

We now determined specific pieces of equipment needed by actually studying the operations to be converted. Again, we had the assistance of the management consulting firm.

To be converted were:

1. Billing for more than 400,000 customers per month—this was in four of our eight divisions, each with about 100,000 meters at the present time. The other four are smaller, and for the time being no change-over for them is

being planned.

2. Payroll for more than 2000 Southern Counties employees.

3. Materials and supply inventory, covering more than 8000 items at a value of $1,500,000.

4. Account payable distribution, charges from more than 4000 invoices per month.

The three last change-overs were to be made at our Los Angeles headquarters.

July 1, 1955 — a year and one-half after we began our studies — was set as the target date for the change-over in the Los Angeles office and the San Gabriel Valley division, which currently serves more than 110,000 meters and is one of our larger operating divisions. To meet that date we had to get busy.

Six months prior to putting mechanization into effect, we ordered the equipment and determined the space requirements for personnel and machines. These specifications were turned over to our construction and distribution department for necessary remodeling arrangements, which included soundproofing the rooms in which the equipment would be operated.

We studied our personnel requirements. Two choices faced us: Should we hire new personnel skilled in running the machinery but not acquainted with company operations, or should we use our own people and teach them to run the new machinery?

We decided on our own people whose dependability and know-how had been proved on the job.

So we removed key personnel from other assignments and had them trained locally and at schools run by the equipment manufacturer, and told them to plan minutely for the move.

In the last month prior to the change-over we sent operating people to school and conducted classes for key personnel in our accounting and customer departments, who might be even remotely connected with the new equipment. More than 50 attended these familiarization sessions.

The new equipment was tested, and when the change-over was made it was almost anticlimactic after the months of detailed planning. The mechanized equipment went on the job with a minimum of operating difficulty. This we attribute in large measure to the careful planning and employee training programs followed by the company.

Is Southern Counties happy with the performance of its punchcard tabulating equipment?

"The jury is still out." Two months after we installed the equipment in the two offices, we are running only a one-third load while employees become accustomed to the new processes. The trends show that eventually the answer will be an unqualified "yes."

For the benefit of those who worry about automation causing personnel problems: Our employees operating the new equipment find "work more interesting and less tiresome" than before.

As for management, three factors are of utmost importance:

1. Mechanized equipment was a necessity for this company so that we could keep up with our rapid growth that is certain to continue in the future and at an increased rate.

2. The equipment will definitely stabilize our manpower requirements for the operations involved.

3. Following a six month "preflight" period, our estimate of the time it will take to get full production, we expect substantial savings.

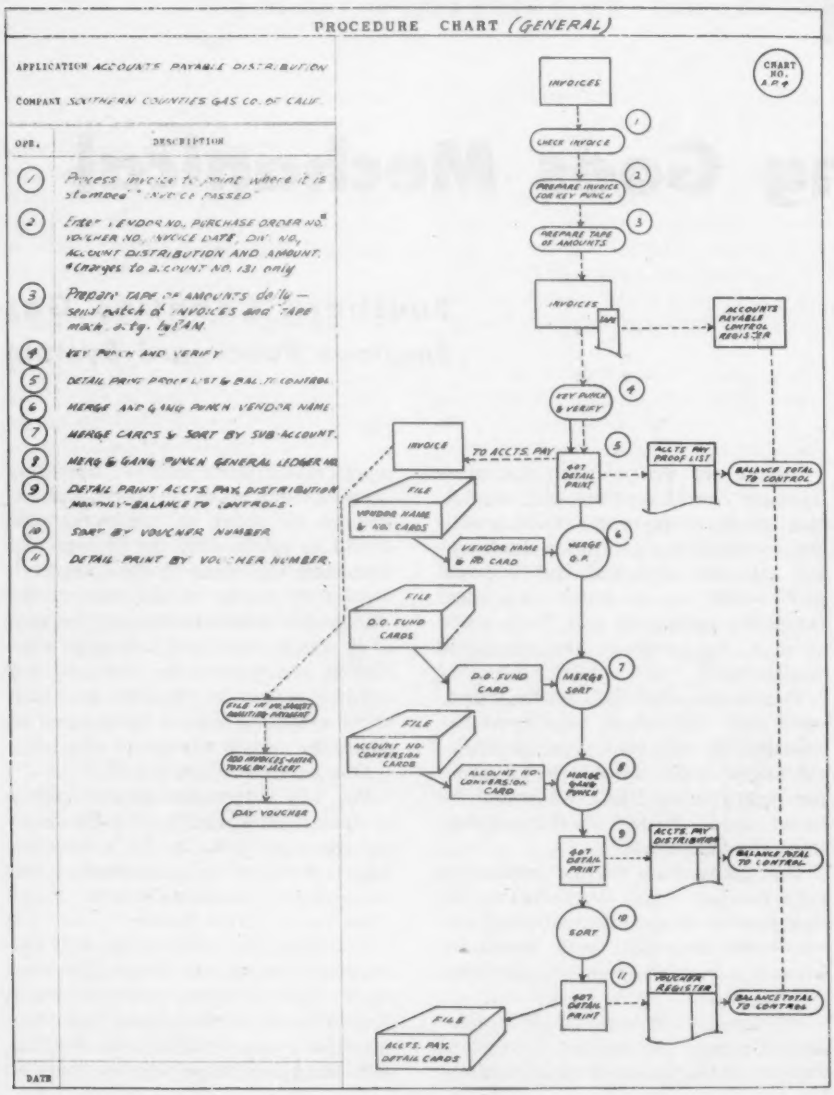
For the two offices where equipment is now installed, significant annual dollar savings already can be forecast.

Further annual dollar savings will be realized when we install the equipment in our eastern division, headquartered in the Pomona area, and in our Orange County and Santa Monica Bay divisions. We expect to make the switch in the eastern division this fall and in the other two operating areas during 1956.

A hidden but nevertheless very welcome by-product of the change-over is the ready availability of data that previously could not be compiled due to the time-consuming manpower requirements involved. For example, specific information for inventory and minute detailing of material usage are now readily accessible.

What, without the punchcard tabulating equipment, would once have taken days to figure is now available in a few minutes.

Our change-over continues to be on schedule. At one time, it seemingly would never get here, but the period of planning and preparation that held it back made the conversion easy, when it came. ★ ★ ★


PROCEDURE CHART (GENERAL)
APPLICATION ACCOUNTS PAYABLE DISTRIBUTION
COMPANY SOUTHERN COUNTIES GAS CO. OF CALIF.
OPR.
DESCRIPTION
Process invoice to point where it is stamped "INVOICE PASSED"
Enter VENDOR NO., PURCHASE ORDER NO., VOUCHER NO., INVOICE DATE, DIV. NO., ACCOUNT DISTRIBUTION AND AMOUNT. *Charges to account NO. 131 only
Prepare tape of amounts daily — send batch of invoices and tape each day by 9 A.M.
KEY PUNCH AND VERIFY
DETAIL PRINT PROOF LIST & BALANCE CONTROL
MERGE AND GANG PUNCH VENDOR NAME
MERGE CARDS & SORT BY SUB-ACCOUNT
MERGE & GANG PUNCH GENERAL LEDGER NO.
DETAIL PRINT ACCTS. PAY. DISTRIBUTION MONTHLY—BALANCE TO CONTROLS.
SORT BY VOUCHER NUMBER
DETAIL PRINT BY VOUCHER NUMBER.
DATE
CHART NO. A-P-9
INVOICES
CHECK INVOICE
PREPARE INVOICE FOR KEY PUNCH
PREPARE TAPE OF AMOUNTS
INVOICES
DATE
ACCOUNTS PAYABLE CONTROL REGISTER
KEY PUNCH & VERIFY
INVOICE
TO ACCTS. PAY.
GET DETAIL PRINT
ACCTS PAY PROOF LIST
BALANCE TOTAL TO CONTROL
FILE
VENDOR NAME & NO. CARDS
VENDOR NAME & NO. CARD
MERGE G.P.
FILE
D.O. FUND CARDS
D.O. FUND CARD
MERGE SORT
FILE IN PO-INVOICE AWAITING AMOUNT
ADD INVOICES-ENTER TOTALS ON SELECT
PAY VOUCHER
FILE
ACCOUNT NO. CONVERSION CARDS
ACCOUNT NO. CONVERSION CARD
MERGE GANG PUNCH
GET DETAIL PRINT
ACCTS. PAY. DISTRIBUTION
BALANCE TOTAL TO CONTROL
SORT
GET DETAIL PRINT
VOUCHER REGISTER
BALANCE TOTAL TO CONTROL
FILE
ACCTS. PAY. DETAIL CARDS

In new operating base are, left to right, John F. Allman, utility clerk; Harold Adamson, administrative assistant; and Marshall D. Egan, division superintendent. (Below) Office building of new $533,000 Southern Counties Gas Company operating base in Pomona. Fluted all-steel construction, the building is gas-air conditioned.

Southern Counties Gas Designs

Functional Operating Base

Combining Beauty, Economy, Efficiency at Pomona Division

● When Southern Counties Gas Company contemplated building a new operating base for its eastern division in Pomona, California, its management tried to please everybody connected with it: The employees who were to work there, the people in the community, the architect and contractor.

Now that the $533,000 base is completed and fully operative, company officials feel in the main they succeeded in making everyone happy. The base is architecturally pleasing and yet it is fully functional. And it was built at a cost of $15 per square foot, average.

Pleasing a lot of people with divergent views calls for luck and patience. Southern Counties' management had both but, when necessary, was also firm.

The company seriously began planning the base more than two years ago. The first job was to crystallize the thinking on all levels as to just what functions and needs the base had to fulfill.

While this may seem somewhat elementary — and it is — this kind of advance planning made actual construction harmonious and relatively simple.

Division personnel were asked their likes and dislikes; heads of departments whose operations were to be housed in the new base were asked what they needed.

This information was merged with top management planning, and, after lots of sifting, the company came up with a list of functional specifications. Everyone connected with the project had his say prior to final design.

Because of reputation and familiarity with local conditions, as well as for public relations value, B. H. Anderson, AIA, of Pomona, was selected to design the base.

Anderson was given the company's functional specifications along such general lines as: Number of employees to be housed, general pattern of workflow, and storage and service space needed. After he had approval of his preliminary drawings, it was his project from that point.

This autonomy for the architect was such that at one point during construction Anderson asked a company

FEATURE
American Gas Journal

All-weather dock of warehouse at Southern Counties new Pomona, California, operating base.

Interior of Pomona warehouse shows racks of meters ready to be set.

official, "Are you fellows mad at me? You haven't been around for so long I'm worried."

The fact that there was no "front-office" supervision during construction of the base was mutually beneficial for the architect and for the company.

That's not to say that the job went through exactly as it came off the architect's drawing boards. Company management felt that plans had been well enough laid that there was no need for expensive and time-consuming changes.

Changes that had to be made were worked out by the architect, the contractor, and Southern Counties' construction superintendent. For the period of construction, the superintendent was relieved of his other duties and assigned full-time to the project. He was told to concentrate on "bringing the new base in," as the company's liaison with the architect and with the contractor. He secured construction in line with the approved plans and specifications. But, his responsibility was not fulfilled by insistence upon blind adherence to the approvals. As in all construction, there were errors of both omission and commission.

Southern Counties decided early that changes would be made simply, on-the-job, with a minimum of red tape. This was a new policy for the gas company — elementary but very effective.

The result more than justified Southern Counties' faith.

The new Pomona base will serve an area that shows the greatest percentage growth in what is, in turn, one of the fastest growing gas utilities in the world. Southern Counties' eastern division, headed by Manager Homer R. Mead, currently serves more than 85,000 meters and expects to bring that total to nearly 92,000 meters by the end of 1955.

There are buildings covering six acres of the site in Pomona: Office building, locker room, warehouse and garage — as well as open pipe storage and parking areas. They provide 29,050 sq ft of floor space.

The actual land purchased for the base was eight acres; two acres were left undeveloped to allow for almost certain future expansion of the base.

It was this future expansion that largely motivated the architect to choose as his basic construction material a fluted galvenized steel (Robinson siding). This type of construction was a departure for Southern Counties.

The fluted steel had several advantages from the company's point of view. Its trim appearance added greatly to the acceptance of the buildings. In addition, its light weight made footage problems considerably easier to solve and materially reduced initial building costs.

But the factor that swayed the company most was the relatively greater flexibility of fluted steel. Southern Counties' Pomona base now services the 85,000 meters of the eastern division, and this new structure as it stands should be able to serve as many as 120,000 meters with ease. The present site is laid out to allow for expansion to 150,000 meters with little trouble. After that, the two reserve acres could increase even that total considerably. Added construction with the light fluted steel would be relatively simple and less expensive. In an area of fast population growth, this factor of flexibility is a vital one to Southern Counties.

An office and operations force of more than 150 employees will be centered at the new base, which will house the division's distribution, construction, customer service and customers departments. To provide comfort in the office portion of the base, two 25-ton Servel gas air-conditioning units are used. Here again, Southern Counties found that the experience of planning for and installing these Servel units would save "hidden" installation costs in future expansions or building operations, since many of the problems encountered and the solutions that were worked out will save time and effort in future construction work.

Wherever possible throughout the structures, Southern Counties used local materials and local contractors. Some of the building materials and fixtures in the new base were slim lighting fixtures, for good overall lighting; vinyl asbestos flooring, and the warehouse truck-height dock. A large all-weather canopy over the warehouse dock gives day-and-night protection for loading crews and speeds up operations.

Two new completely adjustable hoists, one for passenger cars and light pickups and one for trucks, are work-saving features of the base garage. The two hoists have adjustable front posts that can be moved back and forth to fit any wheel base, enabling them to service any piece of automotive equipment in the company's large and varied fleet.

The locker rooms for the crews were designed to provide ample space for both present and future needs. Convenient, comfortable showers and lockers for crew personnel are an integral part of the company's personnel policy. The location of this unit was carefully considered to give easy access from all parts of the base.

A convenient feature of the warehouse layout is the location of the glass-walled office, which gives constant over-all visual control of stores, yard and warehouse facilities.

The new base, which replaces an older plant, was formally opened with openhouse celebrations for gas company friends, employees and other guests. The civic leaders, who were taken on an extensive tour of the new base, were generous in their praise for a structure that they felt added both utility and beauty to the Pomona industrial complex.

Guy W. Wadsworth Jr., president and general manager of Southern Counties, summed up the feelings of the company when he said that the new structure marked a milestone for the company as well as for the Pomona area.

Southern Counties seems to be happy with the results of its new construction policy and intends to apply it in future expansion and modernization projects. ★ ★ ★

This article is based on a presentation by Peter G. Behr, Portland Gas & Coke Company, before a distribution conference, Pacific Coast Gas Association.

A Persistent and Organized Method of Protection

Distribution Structure Damage Reduced

● Since World War II, Portland Gas & Coke Company experienced an increase in the number of accidents involving damage to its underground structures, both on public thoroughfares and private property. Although construction of all kinds increased manifold during the postwar period, certain factors directly influenced street area construction and caused disproportionate increases, including:

1. Large sums returned to cities and counties from state gasoline tax.
2. Enforcement of Water Pollution Control Act, requiring cities to construct sewage disposal plants and facilities.
3. Issuance of highway bonds to accelerate highway modernization program.
4. Construction of large subdivisions in outlying areas, which require construction of street, water and sewer systems.
5. Petitions of property owners for street improvements.

Oregon law provides that part of the receipts from various motor vehicle licenses, fees, motor fuel taxes and fines for violation of motor vehicle laws would be reapportioned *to the cities and counties* for road improvements. As an example, the sum made available in 1950 to cities and counties in the Portland Gas & Coke Company service area amounted to nearly $6,000,000.

The Oregon State Sanitary Authority administers the Water Pollution Control Program, which has resulted in widespread revamping of sewerage facilities of cities served by Portland Gas & Coke Company. The construction in Portland alone has cost $13,700,000 since World War II.

Items 3 and 4 are familiar throughout the country. Highway construction has of necessity been heavy to accommodate the greatly increased number of motor vehicles. Large new subdivisions are common sights on the fringes of western cities.

Petitions for street improvements can be attributed in part to the postwar population influx, which has resulted in more complete saturation of building lots in certain residential districts. With more property owners to share the cost of street improvements, the number of petitions for such improvements has shown a marked increase.

A few accidents due to construction resulted in extensive damages and the Portland Company undertook an intensive study directed toward minimizing accidental damage to underground piping. Every instance involving interference to underground structures was viewed as one presenting a potential hazard.

Experience has been that approximately 65 per cent of the accidents to underground structures occur on lines located in public thoroughfares and 35 per cent to lines located on private property. A different approach is required for each type of accident.

Inspection Program

The first step was to concentrate on accidents occurring on public streets by augmenting the company's field inspection service while other preventative measures were being studied and developed. Two separate inspection divisions were established: Road construction, reconstruction and maintenance, and trench excavation work.

These separate divisions were established because:

1. The two types of construction present different problems. Grading work involves determination of grades, vertical structure clearances and analysis of soil conditions. Trench excavation work usually requires the determination of horizontal structure clearances and analysis of soil conditions, with emphasis placed on the possibility of cave-ins and/or settlement, and the need for special protection, such as bracing of cribbing. Knowledge of backfilling techniques is also important to the trench excavation inspector.
2. Different equipment is used for grading and trench excavation, and familiarity with equipment is a necessary requisite of a competent field inspector.
3. It is common for contractors to specialize on grading or trenchwork, and it was thought that company relationships with contractors would be enhanced by the specialization of inspectors.

Records of all construction jobs affecting gas structures are kept. Data included in these records are type of job, total length, footage of gas structures affected, number of mains and services crossed, number of accidents and the name of the contractor, municipality or utility performing the work. A yearly report summarizes the construction work that affects gas structures.

It was brought out that lack of notification of work was mainly responsible for pipe damage. At the same time the inspection program was expanded, and additional attention was given the problem of securing sufficient notification from the various agencies who do work in public streets.

While communications were always maintained with the various city engineers and public agency authorities concerning major construction projects, efforts were intensified and by doing so projects were reviewed in the design stage. This was found to be extremely advantageous in the case of sewer projects. Inspectors check the proposed routes with city field engineers, locate gas and water pipes and help see that interference with gas structures is kept to a minimum.

Classification of Accidents

In 1953, the central safety committee, known as the "A" Safety Commit-

tee at Portland Gas & Coke, turned to the problem. Accidents involving underground piping were thought to be worthy of further study and consequently a group known as the Public Accident Committee on Underground Piping was established.

This committee undertook to define and classify accidents involving underground piping. In order to provide for uniformity in compiling statistics, it was necessary at the outset to define what constitutes an accident to underground structures. This definition was adopted: "Any damage to gas structures located off company property that results in maintenance expense shall be considered as an accident to gas structures."

A method of classifying accidents was needed in order to guide further committee efforts. It was noted that, basically, accidents involving underground piping can be divided into two classifications: (1) Accidents due to construction work of which the company has knowledge; and (2) accidents that are due to construction work on which no notification is received.

Included in (1) are major road, sewer and water construction projects such as are undertaken by state, county and municipal agencies and utilities. Also included are minor street maintenance construction jobs and other work on which the company received due notification. Category (2) covers all accidents due to work of which the company was not informed. The type of work that causes these accidents is usually small-scale street construction, or private building, landscaping or home construction.

Having divided the accidents into these two classes, a further breakdown was made. Accidents were classified by the agency responsible for the damage: Private party (individual), contractor, utility, municipality, etc. Since the direct cause of the damage is pertinent, they were also classified in this manner. This last classification shows the type of work being carried on when the damage occurred.

The majority, about 85 per cent, of accidents involving underground piping occur on jobs that involve excavation of some description, and over 90 per cent of this damage is done by power excavating equipment. Trenching, grading, pole hole excavation, basement excavation, tree removal and plowing are types of excavation operations that cause most damage to gas structures. More and more power equipment is being utilized both by individual homeowners for gardening chores and by contractors for all kinds of excavation. The number of accidents per month increases during the late spring, summer and early fall months due to increased construction and landscaping activity. Some types are strictly seasonal in themselves, for example, accidents due to gardening and plowing.

Previous to the formation of the Public Accident Committee on Underground Piping, a monthly report of damage to underground structures was published that classified accidents according to whether the party causing the damage was billed or the expense was absorbed by the company. The report also tells whether the structures were located and marked in advance of construction activities.

This report has been supplemented by a monthly accident summary that classified accidents according to the causes of damage (Table 1). As this tabulation shows, accidents of many descriptions occur on construction jobs of which the company has no knowledge, but where due notification has been received by the company, damage results almost wholly from three types of construction: Street grading, sewer and water main construction. Damage to structures that occurs on jobs of which the company receives notice is due in most cases to contractors' negligence or the fact that the pipes were not properly located and marked, relocated or by-passed by the company.

It was reasoned that it would be valuable to know who was responsible for accidents as well as how the damage occurred, and, therefore, they are also classified according to the party or agency responsible for the damage. This breakdown, shown in Table 2, is combined with data shown in Table 1 and published monthly. Responsibility is determined by and tabulated according to these classifications:

A. **Private Party.** This includes all accidents due to a property owner's negligence when the individual is doing the work himself. Typical accidents in this category are due to gardening, tree removal and other minor excavation jobs involving hand excavation.

B. **Contractor for Private Party.** Included here are accidents caused by light excavating machinery of the type owned by small or part-time contractors. Accidents typical of this classification are due to excavations for culverts, drains, basements, tanks, lot leveling or grading, lawn sprinkling systems and plowing.

C. **Contractors.** This category includes building contractors working on individual houses or buildings, subcontractors doing specialty excavating work and also grading and project excavation contractors. Accidents involved here are of the same type as in B above and also include accidents due to street

TABLE 1.
Summary of damage to underground structures.

Portland Gas and Coke Company
Period January 1, 1954 to December 31, 1954

Cause of damage	Company notified No	Yes	Total
Motor vehicle	10	0	10
Service sawed	10	0	10
Tree removal	6	0	6
Gardening	2	0	2
Plowing	7	0	7
Trench excavation			
Culvert	5	0	5
Drainage ditch	3	0	3
Sewer service	8	1	9
Water service	3	0	3
Septic tank	1	0	1
Oil tank	2	0	2
Water main	14	32	46
Sewer	5	29	34
Telephone conduit	0	1	1
Excavation			
Pole hole	6	0	6
Basement	10	2	12
Grading			
Lot	46	0	46
Street	14	34	48
Gutter	9	0	9
Wrecking building	4	0	4
Moving building	3	0	3
Miscellaneous			
1	1	0	1
Totals	169	99	268

TABLE 2. Analysis of accidents involving damage to underground structures.

Portland Gas and Coke Company
Period January 1, 1954 to December 31, 1954

Company NOT Notified

Classification	Thru May 31	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
A. Private party	20	2	4	4	2	2	2	3	39
B. Contractor for private party	17	4	4	7	9	8	2	1	52
C. Contractor	10	2	3	1	2	1	2	—	30
D. Commercial establishment	2	—	—	—	—	—	—	—	2
E. Utility	4	—	2	—	1	—	2	1	10
F. Municipality	7	5	—	2	1	4	—	1	20
G. County	3	2	—	—	1	3	1	1	11
H. State	0	3	—	—	—	1	1	—	5
Total	72	18	13	14	16	19	10	7	169
Cumulative total	72	90	103	117	133	152	162	169	—

Company Notified

Classification	Thru May 31	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
A. Private party	0	—	—	—	—	—	—	—	0
B. Contractor for private party	0	—	—	—	—	1	—	—	1
C. Contractor	33	2	8	12	3	3	4	—	65
D. Commercial establishment	1	—	—	—	—	—	—	—	1
E. Utility	3	1	—	—	—	—	—	—	4
F. Municipality	5	4	4	3	5	2	—	2	25
G. County	1	—	—	—	2	—	—	—	3
H. State	0	—	—	—	1	—	—	—	1
Total	43	7	12	15	11	6	4	2	100
Cumulative total	43	50	62	77	88	94	98	100	—

grading, sewer and water ditch excavations.

D. **Commercial or Business Establishments.** This includes firms employing maintenance personnel doing occasional excavation work.

E. **Utilities.** Included here are the power companies, telephone companies and the various water districts located in suburban areas. Typical accidents are due to pole hole excavation and trench excavation.

F. **Municipalities.** This group includes the street maintenance departments and water and sewer departments. Accidents in this category usually involve street grading or trench excavating equipment.

G. **Counties.** This heading consists of the county road departments that do both new road construction and maintenance work.

H. **State.** Included here is the State Highway Maintenance Department.

In 1954 more than 70 per cent of the accidents that occurred on jobs of which the company had received no notice were due to the operations of private individuals, small contractors working for private individuals or building contractors. Many of these accidents occurred on private property and involved gas services only.

Of the accidents that occurred during 1954 on jobs where the company had received prior notification, 90 per cent were due to operations of grading and trenching contractors and municipal maintenance forces.

Accident Frequency Rate

The need of a yardstick to measure the accident frequency rate was recognized by the committee at the outset, and it was agreed that a rate based on the total miles of main and service pipe would provide a proper index. The formula adopted to determine the accident rate is:

Number of accidents for 12-month period × 1000 = Frequency rate total miles of pipe in system.

The primary reason for establishing a frequency rate instead of merely comparing 12-month cumulative totals is to give a basis of comparison with other companies' experience. The multiplier of 1000 is to eliminate a decimal figure. The total miles of pipe figure is adjusted at the beginning of each calendar year.

Table 3 shows the accident frequency rate for 1954 by months as obtained from the formula. The frequency rate is higher for the months of April, May and June, 1954, than it was at the end of 1953. Fluctuations in a figure based on a 12-month cumulative total are bound to occur, however, because months when a large or small number of accidents occurred are sometimes added in at both ends of the 12-month period.

Variations in accidents totals by months are due to construction activity, which in the Portland Gas & Coke service area is affected by weather.

Measures Designed to Reduce Accidents

Having defined the problem and set up statistics for purposes of control and analysis, the committee next set out to find means by which damage incidence could be materially reduced. It was noted that over 60 per cent of the total accidents involving underground piping occur on jobs of which the company has no knowledge, and the need for obtaining better notification on light construction work was recognized. Most accidents can easily be avoided by locating the affected gas structures prior to construction.

Most cities require permits to be issued before any work is done in street areas. Previous Portland Gas & Coke practice was to obtain a copy of the sketch issued with the city permit in order to determine whether gas structures were affected by the proposed construction. These "permit jobs" were often done the same day the permit was issued, however, and it was difficult to inspect them. It was also difficult to find the contractor involved due to the fact that generally no formal call for bids was made.

In order to obtain better notification on this type of job, the city of Portland was persuaded to mark all permit sketches with a stamp that reads "Notify Affected Utility Before Commencing Work." The stamp lists the telephone number and proper extension of Portland Gas & Coke, along with other utilities and city bureaus.

TABLE 3.
Accidents and frequency rates by months.
Portland Gas and Coke Company
Frequency rate based on 4383 miles of pipe.

Month	Number	12 Month total	Frequency rate 12 months ending
January, 1953	23	—	—
February	12	—	—
March	15	—	—
April	22	—	—
May	22	—	—
June	29	—	—
July	42	—	—
August	38	—	—
September	33	—	—
October	35	—	—
November	17	—	—
December	19	307	70.0
January, 1954	12	296	67.5
February	16	300	68.4
March	21	306	69.8
April	35	319	72.7
May	31	328	74.8
June	25	324	73.9
July	25	307	70.0
August	29	298	68.0
September	26	291	66.4
October	25	281	64.1
November	14	278	63.4
December	9	268	61.1

In this way, the party receiving the permit was made responsible for giving proper notification, and the company almost immediately began to receive word of more jobs, together with details, than before. Permits for which no construction sketches are made are also issued, and the letters of transmittal to the applicant that accompany these permits now also request that utilities be notified. A copy of these letters is forwarded to the company by the city.

These measures have been effective in securing better notification on small street area construction projects. Several other cities have now adopted the practice of stamping permits, and efforts are being made to persuade all cities within the service area of Portland Gas & Coke to conform to this procedure.

The notification stamp increased the number of inquiries on street area construction but was not effective for construction that takes place on private property. Accordingly two informational pamphlets have been prepared for distribution to customers and a more extensive pamphlet for plumbers, building contractors and consulting engineers. It is hoped that the distribution of these pamphlets will further diminish the number of accidents involving underground structures.

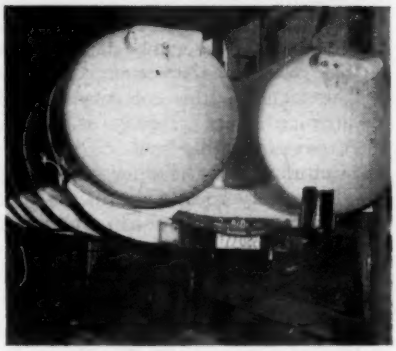
Results

As in many safety programs, some of the benefits are intangible. Relationships with the excavation contractors in Portland's service area have been improved by the inspection program. Contractors respect the company for making an effort to relocate or otherwise safeguard structures in advance of construction wherever possible. Inspectors often receive advance notice of construction through their acquaintances.

Stamping of permits with requests for notification has resulted in obtaining advance knowledge of much more minor construction work than in former years. Since even the smallest excavation jobs now utilize mechanical equipment capable of inflicting major damage to any underground system, it is increasingly important to inspect the small excavation projects as well as the large.

No evaluation of the informational pamphlets can yet be made. Accidents were reduced in 1954 from the totals in 1952 and 1953, and althouh reduction was not phenomenal, it was substantial. Referring again to Table 3, it can be seen that there were 39 fewer accidents in 1954 than in 1953.

The steps taken have materially reduced the hazards to structures and the statistics will permit evaluation of measures adopted in the future. ★ ★



Standard butane tank car (above, left) used in transfer of natural gas from Southern California Gas Company to Portland Gas and Coke Company. (Above, right) Pressure vessel used at Portland, Oregon, to store the natural gas after tank car arrived. (At right) Trailer-mounted dual butane tanks used to deliver natural gas to Portland Gas and Coke's testing laboratory. The trailer is piped to the laboratory while gas is being used. Each tank holds approximately 860 cu ft of gas at 50 psi.

California Delivers

Natural Gas to Oregon—*by Tank Car*

● Natural gas by the carload may be a strange unit of measure and an unusual means of transportation, but that was exactly the order received by Southern California Gas Company from Portland Gas & Coke Company, Portland, Oregon.

Portland was looking forward to its changeover to natural gas and wanted a large sample to use in experiments.

The request needed careful study and preparation by both companies. Portland borrowed a propane tank car and obtained the necessary shipping permits.

Accident liability problems were discussed with SoCal's legal department, and mutual agreement was reached that the company responsibility would cease when the filled car was turned over to Southern Pacific Railroad. Safety Engineer E. E. Taylor reviewed the operation in terms of accident prevention and applicable safety codes.

Then it was necessary to find a source of natural gas that would be comparable to what Portland will later receive, at a pressure above 250 psi, and reasonably near a railroad siding.

Gas from Burrel field, in northwest corner of the California company's San Joaquin Valley division, was finally selected and the borrowed tank car was spotted on a siding paralleling the 10-in. transmission line.

In the actual filling process, it was necessary to lay several hundred feet of temporary line, and to purge thoroughly the tank car of residue propane vapor.

When the car had been pressurized to 225 psi, it was turned over to the railroad.

It is estimated the tank car contained 22,566 cu ft of California gas—about enough to supply an average residential customer for three months.

In the meanwhile, at the production plant of Portland Gas & Coke Company, a steam accumulator had been painted and made ready to serve as a pressure vessel to receive the gas. This pressure vessel, 8 feet in diameter and 38 feet long, has sufficient capacity for one tank car of gas at approximately 300 psi.

When the car of gas arrived in Portland, 80 feet of 2-in. pipe were laid temporarily to move gas from car to pressure vessel, which was filled with water. The initial transfer of gas was made by equalizing the pressures between the tank car and the receiver.

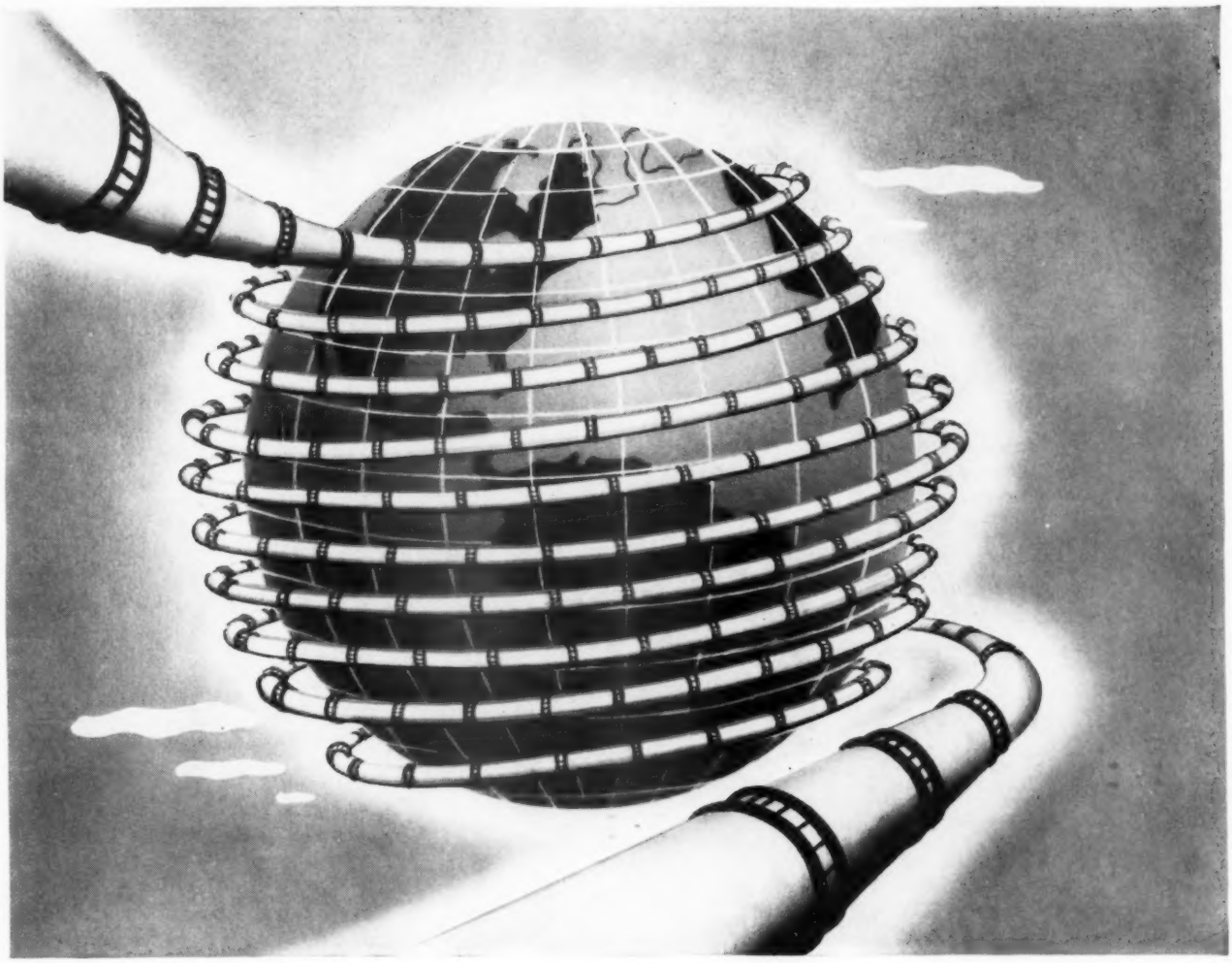
When the pressures were equalized and there was no further transfer of gas, a hose was connected to the liquid leg of the tank car and water was pumped into it at 150 psi to force the gas into the receiving vessel. The water pressure had to be increased to 180 psi to complete the transfer.

To make sure that all gas was out of the tank car, a test riser was opened on the pipe carrying the gas to the pressure vessel and, when water appeared, it was assumed that the tank car was free of gas and, of course, filled with water. It was then turned over to a tank car cleaning service, which took out the dome structure, dried it, made a complete inspection of it and declared it in A-1 condition for transporting LP gas again.

In order to make the gas available at Portland Gas & Coke's testing laboratory, a portion of it was transferred to a trailer-mounted butane tank which was then connected to the laboratory piping, where it will remain in place while the gas is being used.

Portland is using the natural gas to determine the conversion procedures necessary to convert appliances to natural gas. By doing extensive pretesting, it is hoped that many conversion "headaches" can be avoided in advance of actual conversion. The testing program will require approximately one tank car of natural gas every 2 months.

Total cost of shipment and handling will approximate $1500 per tank car, Portland Gas executives say, although the cost of the gas itself is only $6.50 at the point of loading. ★ ★ ★



HALF A MILLION MILES FROM MALTA

Back in the 1880's, the by-product of oil—natural gas—was usually flared at the wells. The leaky, threaded-joint pipe lines of that day made it impossible to transport gas under pressure.

This waste so disturbed Solomon R. Dresser, a Bradford, Pa., oilfield manufacturer, that he set out to perfect a truly gastight pipe joint.

Having pioneered in the use of rubber to cap oilwells, he developed an amazingly tough rubber compound. Around this he built his coupling, designed so that when the bolts were tightened, the rubber gasket compressed and formed an absolutely gastight seal.

To prove its worth, he bought a gas well and built a 5-inch, 4-mile pipe line to Malta, Ohio . . . and later to McConnelsville across the Muskingum River. Recently, parts of the Malta line were inspected by Dresser engineers. The rubber gaskets compressed in the couplings were still lively, the couplings still gastight.

Since Malta, more than half a million miles of pipe have been protected with leakproof Dresser Couplings. If this were a continuous pipe line, it would stretch, gastight, 20 times around the world.

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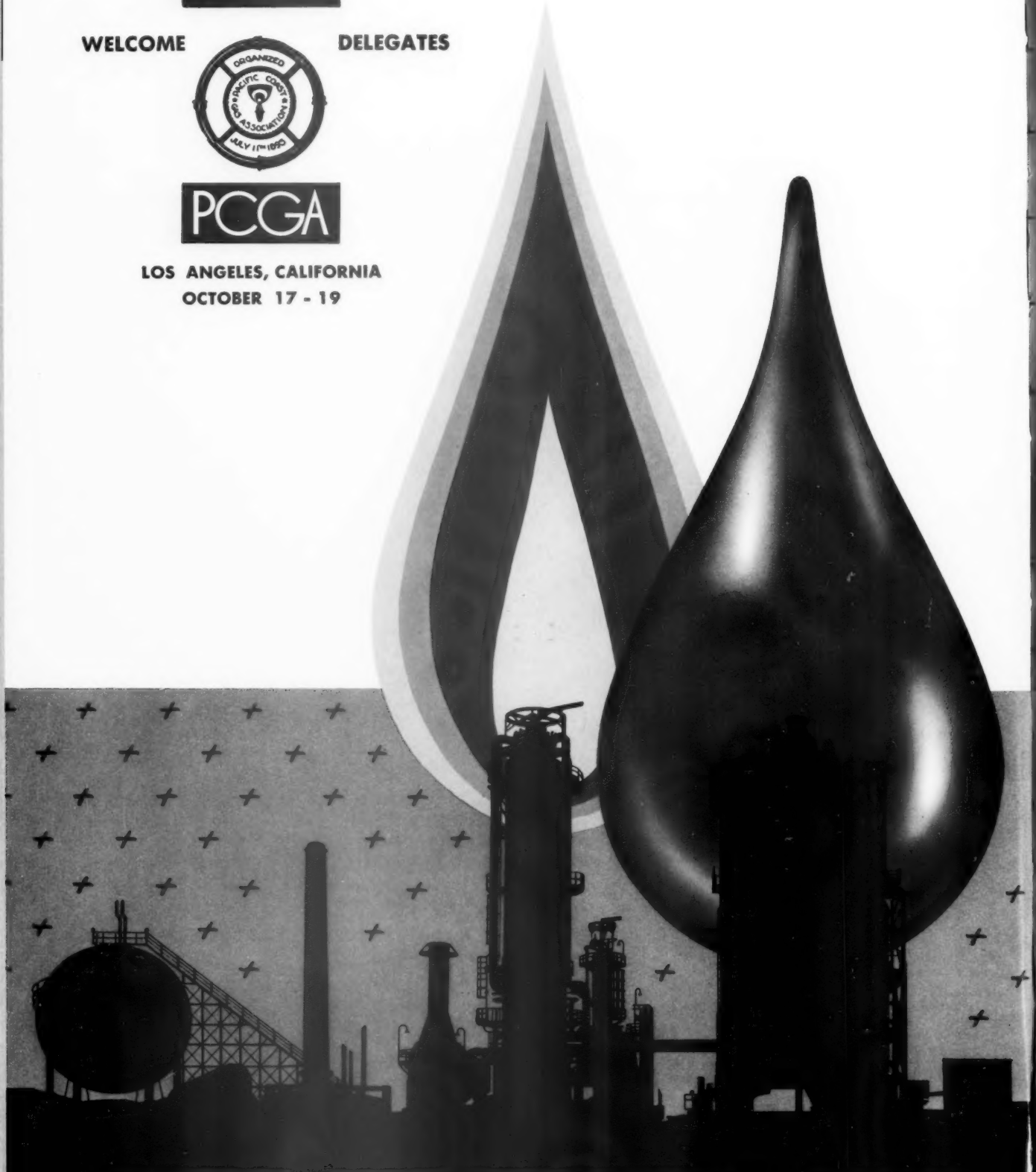
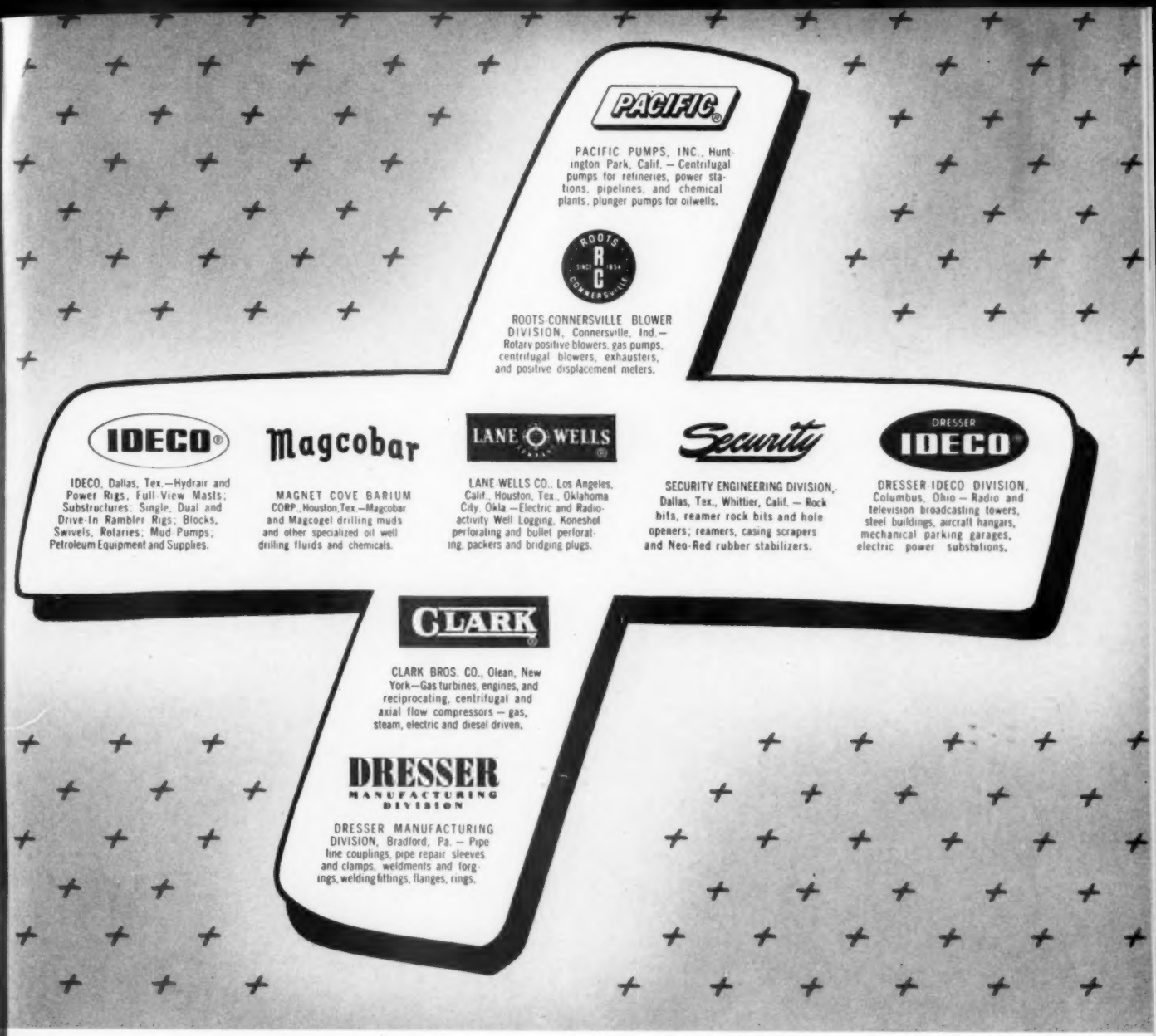


OIL AND GAS–BASIC ENERGY FOR AMERICAN PROGRESS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Southern California Gas Company

Southern Counties Gas Company

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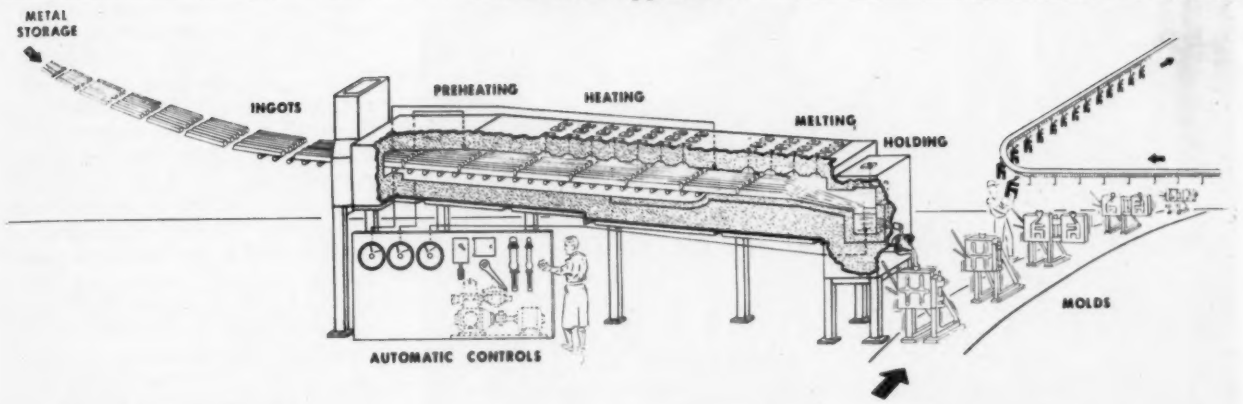


Work-flow diagram of Monarch's gas-fired continuous aluminum melting. Automatic continuous feet of ingots, automatic combustion and pouring temperature control, and automatic pouring are made practical by this design.

Gas and Gas Equipment Combine in Development of First Automatic,

Continuous Aluminum Melting Line

John H. Keating
Vice president, manufacturing
Monarch Aluminum Manufacturing Company
Cleveland, Ohio

● A new gas-fired method of melting aluminum alloys for casting—the first in-line, continuous melting method in this field—is giving Monarch Alumninum Manufacturing Company superior working conditions, reduced foundry overheads, and a closer control on metal handling and casting quality, at a substantial saving in fuel costs.

Monarch aluminum permanent-mold castings and aluminum and zinc die castings are used as appliance and machinery components by many leading manufacturers. As part of a continuing program to improve the quality of these components and to stabilize production rates and control foundry costs, our company has long sought to eliminate the many obvious inefficiencies in conventional melting and pouring methods.

We solved this problem by developing an automatic, continuous melting furnace, which has eliminated wasteful heating of heavy furnace equipment and large reserves of molten aluminum.

The new furnace design employs the Selas Gradiation heating principle: Radiant gas burners operating at high temperatures to effect fast, controlled heat transfer.

A relatively small tunnel furnace slopes downward (about two inches per foot in the units now in use) from the input to the output end. Ingots are loaded at the upper end and automatically pushed lengthwise under a roof of Selas Duradiant burners.

The melting rate and the pouring temperature are controlled by regulating the speed of the ingots through the furnace and the fuel input to the burners. The molten aluminum flows continuously through an opening near the lower end of the furnace, directly into a pouring ladle. This cycle from cold ingot to liquid takes 24 to 30 minutes.

If the direct-pour principle is not desirable from a production standpoint, alternate designs embodying a limited holding-pot principle are readily adaptable.

Gradiation heating, already used in the foundry field in batch melting of magnesium, curing shell molds, drying green sand molds, and other applications, was adapted to the continuous-melting furnace. Natural gas and air are fed in accurately controlled proportions and under controlled pressure to the cup-shaped burners. The mixture is burned within each cup, heating the

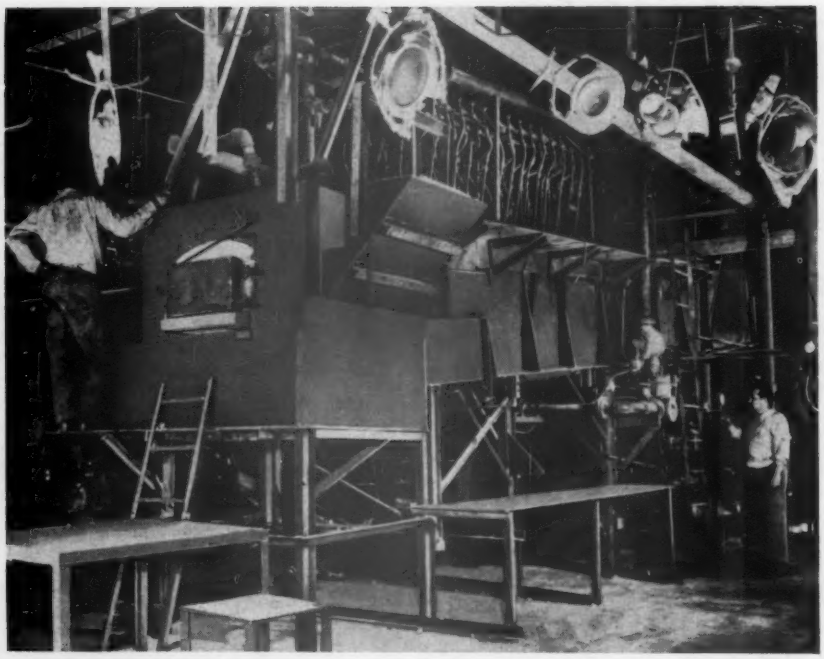
$\frac{\text{Btu}}{\text{Kwh}}$ = Dramatic Industrial Sale

The new metals industry process that is the subject of John H. Keating's article is a clear-cut competitive victory for gas—as gas is represented by the utility and the process equipment manufacturer, East Ohio Gas Company and Selas Corporation of America.

The electric utility was not only "specified' in this case, but an electric pilot plant was actually installed. The industrial department of East Ohio was not deterred by that. They went in selling. Coordination and cooperation between East Ohio and Selas to get to the result that counts—brought about the displacement of the kilowatt equipment and the installation of the first automatic, continuous melting line for aluminum alloy casting.

We still don't like the slogan, but it was never more appropriate: *Gas has got it!*—HHC.

FEATURE
American Gas Journal



Continuous-melt aluminum furnace developed jointly by Monarch Aluminum and Sales. This relatively small, light furnace produces up to 2400 lb per hr of liquid aluminum from ingot for direct pouring into permanent molds.

ceramic lining to incandescence. Heat transfer occurs between the cup and the aluminum charge largely by radiation, bringing the aluminum quickly to the melting point.

Sixty burners, 4 rows of 15, are patterned to provide a radiant roof ten feet long and three feet wide over the final one-third of ingot travel. Combustion products provide preheat during the first two-thirds of ingot travel and may offer some atmosphere control.

Since there is no aluminum in the furnace in a fully liquid state, except in the immediate vicinity of the pour point, there is little chance for the formation of oxides. Each ingot, however, is fed into the furnace already covered with an oxide coating. This coating does not melt, but is moved down to the lowest point of the furnace, outside of the operating region. The furnace operator can remove the collected oxide films from time to time, whenever convenient.

Operation of the continuous-melting furnace is simple. Bringing the start-up charge to pouring temperature takes less than 3 hours. This compares favorably with 24 hours required to start up conventional reverbatory furnace.

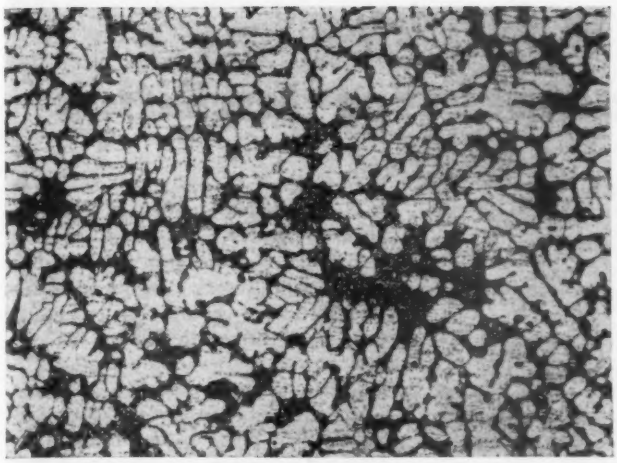
Once operating temperature is reached, the charging rate is set to meet the demand. The fuel flow is adjusted to achieve the desired pouring temperature as the oxide envelope is pierced. Four, 5, or 6 ingots, depending on furnace size, are set on the charging table every five to ten minutes; the exact timing is not critical if suitable loading equipment is provided. The oxide can be removed from the lower end of the furnace 2 or 3 times a shift. Once operation is stabilized, the production rate is easily controlled by adjusting the charging equipment. Pouring temperature is maintained automatically by controlling the burners through a thermocouple in the ladle or small holding pot.

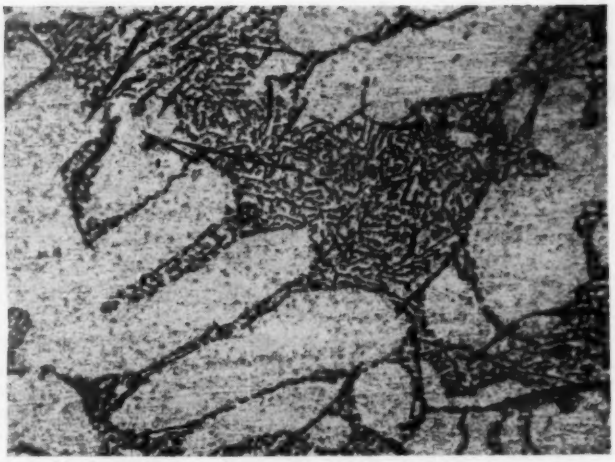
Continuous, controlled output immediately suggests automatic casting, an advancement continuously developed by Monarch during the past 15 years, through the design and installation of mechanical methods to bring the permanent molds past the pouring area of the furnaces.

Quality control has proved to be one of the major advantages of the continuous-melting furnace. Castings are of the same analysis as the ingots they are poured from and are reproducibly uniform from casting to casting. Intermediate alloys can be obtained by mixing ingots of different composition and, if desirable, of different size in the same charge. Ingots weighing 35 to 60 lb are used at Monarch.

When one run ends, the alloy can be changed to meet the requirements of the next run while the furnace is still in operation. This simply calls for antici-

Discharge end of one of Selas continuous-melt aluminum furnaces (left). Liquid aluminum pours off to left as it melts. Automatically loading ingot charges (at right) of aluminum into the continuous-melt furnace. Each group of ingots is deposited on the hearth by the conveyor, then pushed into and through the furnace until the aluminum melts.





Photomicrographs of section of 5 per cent silicon alloy appliance component cast direct from gas-fired continuous-melt furnace at Monarch. Fine, even grain, clean metal, free of voids, inclusions and contaminants is obtained in metal melted for casting.

pating the change and loading ingots to meet the new specifications in time for them to reach the pouring stage as the new molds are placed in service. Alloy can be changed several times in a single shift, if necessary, while maintaining nearly full production.

Aside from analysis, the general quality of the castings has been improved significantly. The short heat cycle, for instance, does not hold the aluminum liquid long enough for much dross to form. For this reason, too, there is practically no gas absorption. The grain structure in test castings shows greater uniformity, although no exact correlation has been established.

One advantage of the continuous-melting furnace is obvious in every department of the plant. This is the elimination of the summer drop in production due to high temperatures in the working areas of the casting room. With conventional reverberatory furnaces, or large holding-pot operations, heating of the air space around the furnaces becomes a serious problem during the summer months. On hot days, men are frequently forced to stop work after only three or four hours of work, and lack of output in the foundry means lack of work in finishing and other departments. As a result, large numbers of employees leave the company every summer and new crews must be trained each fall, despite generally good working conditions and relations in other respects.

With the continuous-melting furnaces, the combined problem of low production and large labor turnover has been solved right at the source. The outside surface of the furnace wall is cool to the touch, and there is no need for holding large quantities of aluminum at or near pouring temperature. The lowest point of the furnace itself is about four feet above the floor, and further elevation of the furnace is entirely practical. Its light weight and small size make possible the suspension of the complete furnace from ceiling structure or a few vertical columns, permitting use of the entire floor space as working area or for other equipment and further reducing the space heating effect.

In addition to the actual reduction in costs, continuous melting provides a much closer control of these costs. The direct costs of melting aluminum become very nearly proportional to the weight melted. Small furnaces for low production rates become practical, and it is economical to start up a furnace of any size even for a short run.

Part of the economy and flexibility of this gas-fired continuous melting lies in the small quantity of aluminum in process. Consider a 2000-lb/hr pouring rate, for instance. In the continuous melting furnace, only 1000 lb of aluminum is being processed at any one time, with only a few hundred pounds of it actually molten. To meet the same production with conventional reverbatory furnaces, on the other hand, about 15,000 lb of aluminum must be held in a liquid state at all times.

Consider these factors from the standpoint of closing down and starting conventional furnaces. Large metal baths require hours to cool off before accumulated dross and oxides can be removed. Holding the melt at temperature over lengthy periods incurs costly fuel bills. Restarting large batch furnaces requires labor and fuel costs that can be drastically reduced by the continuous melt principle.

These new furnaces can be shut down within a matter of minutes with only a few pounds of metal to pour off and a minimum of oxides to remove. There is no need to hold at heat for prolonged periods. The furnace can be restarted and up to pouring temperature in less than an hour under many circumstances when a production delay occurs. Operated for two 8 to 10-hour shifts, the furnace can be closed down during third-shift mold maintenance periods and refired to melting temperature in a maximum of three hours before the start of the first shift the next day. This period is dependent upon the design of the furnace and heating capacity of fire brick.

As a result of eliminating large liquid reserve, as well as greater control of heating, fuel consumption is reduced.

Performance records at Monarch show an over-all gas consumption of 1.9 cf/lb of aluminum melted in the continuous melting furnace as against 3 cf/lb in the most efficient reverbatory batch furnace. Deducting fuel requirements for the warm-up period, the ratio falls to 1.1 cf/lb melted.

Monarch is now using three continuous melting furnaces in the permanent-mold casting room, with capacities of 1500, 1800 and 2400 lb/hr rated at 1400 F pouring temperature. They have been operated at rated capacity and at 60 per cent of capacity without appreciable decrease in efficiency.

Apparently each furnace could be operated at a greater degree of turndown without increasing unit costs. In operating these furnaces, as a matter of fact, Monarch has turned up no evidence that would indicate any limit to building similar furnaces in much smaller or much larger capacities.

The ultimate conversion of all batch-type furnaces to several versions of continuous-melt furnaces is thoroughly planned in Monarch's permanent-mold foundry. Timing will depend upon the life expectancy of present equipment. Designs are being prepared for Selas gas-fired furnaces embodying the continuous-melt principle for effective use in Monarch's die-casting department.

Continuous-melting furnaces are now available to foundries working in aluminum and other low-melting-point alloys through arrangements completed between Monarch and Selas. * * *

Long Beach Gas Department to Complete

Modernization of Compressor Facilities

● By June of 1956, the city of Long Beach, California, expects to complete a compressor station modernization program that was begun shortly after the conclusion of World War II.

Latest unit to receive a face lifting is an old plant in the Signal Hill area, which, by comparison with recent developments, has been obsolete some time. The old station is a 12-unit plant with 2160 HP Western Engine, belt-driven compressors of 30-psi discharge pressure, which have been in operation since 1923. The plant was first located in Dominquez before being moved to its present location at Signal Hill in 1927. It is being completely replaced by a new and modern station expected to cost in the neighborhood of $725,000.

Work of preparing the plans and specifications was done by M. A. Mishkian & Company of Long Beach. The contract called for the engineering to be broken down into three phases, or steps. Phase one covered preliminary design, flow diagram, cost and material estimates. Phase two covered the specifications and bid comparison for the acquisition of the major items of machinery, equipment, pressure vessels, auxiliary facilities, etc. Following the award of contracts for the equipment and machinery, the engineers were able to prepare complete construction plans and specifications for erecting the building and installing the machinery, which was the third and final phase.

This construction contract is now out for bid and is expected to be awarded on or about October 5.

Main units consist of three Model HSRA-4, 550 HP, 300 rpm and two Model HSRA-3, 400 hp, 300 rpm Clark Bros. Company compressors. All of the power cylinders are 14-in. bore by 14-in. stroke for both size engines. All compressor cylinders are 25-in. bore by 14-in. stroke. This selection was made to simplify maintenance and reduce the inventory of spare parts. When all engines are operating fully loaded at the discharge pressure of 50 psi, the total capacity will be approximately 4 per cent greater than required by the specifications.

These main units are equipped with Maxim MH-3 residential-type exhaust mufflers; Air Maze Oil-bath type engine air filter-silencers with backfire-relief valves; Taylor Governor Air Motors and Precisors for speed control from 100 per cent to 60 per cent of rated engine speed; by-pass type, waste-pack oil filters for approximately 10 per cent of the oil pump output, as well as the Puralator Full-Flow Oil Filters and Bosch MJA high-tension ignition systems.

The cooling system consists of circulating raw water from the 10,000,000 cu ft water-seal gas storage holder through the gas after-coolers, oil coolers and compressor cylinders. A closed system using treated water that is circulated through the power-cylinder water jackets and cooled by jacket water cooling units is also used. These cooling units are the air-to-water, forced-draft, finned-tube type.

Since electrical power is to be used to drive the auxiliary equipment, a 100 kw standby electric generator is included in the plant to provide necessary electrical power in the event of an interruption of service or a power failure.

All of the piping is being placed on sleepers above ground and located on one side of the building to add to the attractiveness of the area and make the landscaping more effective. This was felt desirable because of the close proximity of the plant to the proposed San Diego Freeway.

Completion of this new facility will bring the total amount expended by Long Beach Municipal Gas Department for compressor plant modernization alone to approximately $1,750,000 during the past ten years, all of which has been paid for out of earnings. ★

Southern California Gas To Install Network Analyzer

Southern California Gas Company has placed an order with Standard Electric Time Company for the design and erection of a McIlroy fluid network analyzer to solve transmission and distribution problems involving up to 560 pipe sections, 40 individual gas sources and 200 regulator station loads in its vast and fast-growing network in southern California.

Analyzer is being designed to simulate flow of gas through any part of the company's system by substituting flow of electric current through a series of resistances. Gas volumes, pressure and pressure drops due to line resistance are related mathematically with amperage, voltage and circuit resistances.

Answers given by analyzer will accurately and quickly determine what is happening in existing networks or can be set up to determine effect of changes to existing systems before such changes have actually been made. Effects of changes in loads and sources will be better studied, and analyzer is expected to come up with quick solutions or alternatives to operating problems.

At present, analysis is of gas main network problems in transmission and distribution systems at Southern California Gas Company is performed manually, using desk calculators and manual computers. Such equipment is satisfactory in solving gas flow and pressure problems in simple piping runs but has proved inadequate in solving complex problems in transmission and distribution network. Sometimes days or weeks of tedious "cut and try" manual operations are required, with less-than-satisfactory results.

The new electronic equipment is a non-linear, analogue-type computer with capacity sufficient to encompass all transmission and distribution trunk line problems and will represent systems in the distribution network down to the district level. This equipment will provide means of determining effect of loads, pressures, supply sources and pipe resistances to flow simultaneously. Representation of the system will be schematic and changes in conditions can be made with little loss in time.

While resultant answers to problems will be only as reliable as factual information assembled for use by analyzer, ability to simulate proved field conditions and substitute anticipated changes quickly and easily will lead to better knowledge of gas operations and permit exhaustive study of alternate solutions.

The new machine is expected to be installed and in operation in about a year, at a cost of approximately $70,000.—J. S.

References

1. Trunk, Edwin F., "Laclede Applies McIlroy Network Analyzer to Design Calculations for Distribution System," *Gas Journal*, September, 1953, p. 14.

2. Kroeger, Carroll V., "Role of the Computer in Distribution Design," *Gas Journal*, March, 1955, p. 14.

Gas Industry NEWS

Gas Sales and Revenues Have Second Quarter Gains

Total operating revenues of the gas utility and pipe line industry reached a record high of $5 billion for the twelve-month period ended June 30, 1955, the American Gas Association reports. This was a gain of $573,000,000, or 13 per cent over the $4.4 billion in the same period a year ago.

Net operating revenues in this twelve-month period rose to $655,000,000, a 14.5 per cent increase over the $572,000,000 a year earlier. Net income rose from $441,000,000 to $482,000,000, an increase of 9.3 per cent.

Total taxes paid by the gas utility and pipe line industry during the twelve months ending June 30, 1955, rose to $621,000,000 from the $553,000,000 during the same period a year ago. Total taxes, including federal income taxes, represented 12.5 per cent of operating revenues for the gas industry in the last twelve months.

Total revenues of gas utilities from sales of gas to ultimate consumers, excluding sales to other utilities for resale, were $759,000,000 in the second quarter of 1955. This was a gain of 10 per cent over revenues of $689,000,000 in the same quarter last year.

Sales of gas during the second quarter of 1955 amounted to 15.0 billion therms, a gain of 6.7 per cent over the 14.1 million therms sold in the same quarter of 1954. Gas utility and pipe line sales to ultimate consumers totaled 64 billion therms in the twelve-month period ending June 30, 1955. This was an increase of 8.3 per cent over the 59 billion therms sold in the same period a year ago.

On June 30, 1955, a total of 28,000,000 customers, excluding approximately 240,000 customers receiving liquified petroleum gas through utility mains, were receiving utility gas. This was a 3.7 per cent increase over the 27,000,000 customers served a year earlier. Of this total, 25,800,000 were residential customers on June 30, 1955, a gain of 3.7 per cent, or 914,000 more residential customers than a year ago.

Revenues from sales of natural gas to ultimate consumers amounted to $648,000,000 during the second quarter of 1955, a gain of 12 per cent over the $579,000,000 a year ago.

In the second quarter of 1955, sales of natural gas increased 7 per cent to 14.2 billion therms from the 13.3 billion therms sold during the same quarter of 1954. For the twelve months ending June 30, 1955, natural gas sales totaled 60.5 billion therms, an 8.5 per cent increase over the 55.7 billion therms sold in the same period a year ago.

The 22,600,000 natural gas customers on June 30, 1955, represented 80.9 per cent of the total gas industry customers. A year ago, there were 21,100,000 natural gas customers, representing 78.2 per cent of the total gas industry customers.

Sales of manufactured and mixed gas increased 1.6 per cent during the second quarter of 1955 while revenues from the sales were off 0.3 per cent, according to the American Gas Association report.

Tampa Gas Made Subsidiary Of New York Utility Firm

The Tampa Gas Company, serving Florida's third largest urban area, has become a wholly owned subsidiary of Peoples Water and Gas Company with general offices at Miami, according to P. C. Crowen, president of Peoples and of the Tampa company.

The change was effective September 6 and was accomplished through the purchase by Peoples Water and Gas Company, New York City, of the Tampa Gas Company's entire outstanding common stock, previously held by an estate.

The Peoples system, including the Tampa operations, is the largest gas system operating in Florida with a service gas population estimated at 1,500,000. It is also the only gas utility system serving both the southwest and southeast coasts of the state.

An immediate program of modernization and improvement of the Tampa company gas generating and distribution system has been announced.

No changes are contemplated in the key personnel of the Tampa organization. P. C. Crowen is president, A. H. Stack of Tampa continues as general manager, and L. C. Jewett is treasurer and assistant secretary. Andrew B. Young, secretary of the parent Peoples company, is secretary of the local company. John C. Bolender, operating vice president of Peoples, will be operating vice president of Tampa Gas.

Annual gas sales for the combined system, including Tampa, total approximately 2.5 billion cubic feet, and gross operating revenues are estimated at $5,225,000.

R. F. Schulz

L. G. Walker

Motorola Announces New Department and Managers

Consolidation of Motorola's microwave and power utility products departments has been announced. Robert F. Schulz has been made manager of the new department, which will be called the microwave and industrial products department. Commercial sales activities will be directed by Leonard G. Walker, and James Stewart will will be in charge of export and special accounts sales.

Since joining Motorola in 1953, Schulz has directed the engineering, production and sale of the Motorola line of microwave equipment, which includes message circuit, monochrome and color TV relay, and radar relay equipment. His 25 years of previous experience in the electronic industry include various positions in the broadcast industry, consulting radio engineer and supervising engineer and deputy director for Airborne Instruments Laboratory.

Prior to his new assignment, Walker was product manager for power utility products, with responsibility for power line carrier, voice frequency carrier, supervisory control, power line coupling networks and related devices. Before joining Motorola in 1951, Walker was electrical engineer for the Idaho Power Company in Boise. While there, he revamped the utility's transformer maintenance program, developed a system of automatic control of sub-stations and guided design and installation of extensive control equipment. He is a graduate of the University of Utah.

Citizens Gas and Coke Plans Change in Units to 800 Btu

Citizens Gas and Coke Utility, Indianapolis, Indiana, has approved plans to change its gas from 625 to 800 Btu. A contract has been signed with Shriver Gas Conversions, Inc., to begin work with a crew of about 300 men in April, 1956, with completion due in August, 1956.

Entire cost of the conversion, approximately $2,000,000 will be borne by Citizens Gas at no cost to the customers.

How Gas Utilities And Their Employees Can Avoid Law Suits

By Leo T. Parker
Attorney at Law

"Recently we have had suits filed against our company by persons whose relatives were asphyxiated when using ventless heaters. What precaution can we take to forestall financial losses and win suits of this kind?" That was the important question a gas utility executive voiced recently.

A few weeks ago a higher court rendered a decision that clearly answers this question.

Hernandez vs Southern Union Gas Company, 209 Fed. (2d) 606.

A suit was filed against Southern Union Gas Company to recover damages for the alleged wrongful death of a child. The complaint alleged that the gas company was engaged in furnishing gas for heating and other purposes and that it knew, or had reason to know, that certain appliances in the dwelling house where the child had lived were improperly installed or vented.

The testimony disclosed that Albert Garcia, his wife and four children moved into a small home.

On the same day, a plumber installed a gas range in the kitchen and checked a hot water heater and a small, unvented heater. There were no other heating facilities in the house. The Garcias were not at home, and the plumber left a note warning them that heaters of this type were dangerous. The gas company the same day sent a service man to connect the gas with the house. The service man warned Mr. and Mrs. Garcia that unvented heaters were dangerous.

He made the connection with the understanding that it would be replaced as soon as possible and would not be used at night or without open windows. He then adjusted the heater to burn properly and planned to return within a few days to see if a new heater had been installed.

In this particular instance, the testimony showed also that the gas company had taken precautionary measures to prepare to win suits of this kind by positively instructing the servicemen always to explain to consumers the dangers of using unvented heaters unless plenty of ventilation by open windows was provided, and also to properly adjust the burners.

Further testimony proved that the dangers of using such heaters can be minimized by having the heaters properly adjusted. There was a shutoff valve on the heater and also a needle valve to control the flow of gas and air into the heating unit, but there was no gas stop-valve on the line leading away from the heater. The needle valve was covered with a small metal cap that could be easily removed and the gas intake to the heater adjusted.

When the heater was in proper adjustment, it burned a low blue flame. If adjusted to permit the use of more gas than the heater was designed for, a yellow or orange flame would result and would indicate the creation of carbon monoxide gas. When the service man left the Garcia home, the heater was burning a low blue flame and was in proper adjustment.

At about 10 o'clock one night, relatives and neighbors went to the Garcia home and found the entire family in beds, either dead or dying. In addition to the hot water heater, all burners on the cook stove were burning, except in the oven. The small heater in the living room was found to be using about 80 per cent more gas than it was designed to use; a yellow flame was burning through the tops of the radiants, creating carbon monoxide. All windows and doors were closed except one in the kitchen, which was open about 1½ in.

The higher court refused to hold the gas company liable.

"The representative of the gas company adjusted the heater," the court said. "It was functioning properly when he left the Garcia home. He warned the Garcias of the danger and instructed them how to use the heater. They were advised that it should not be used at night or at any time without open windows. The testimony of the city gas inspector was that the heater, under the conditions existing in the house, would have remained in adjustment unless someone tampered with the valves."

For comparison, see McMurdo vs Southern Company, 248 P. (2d) 668, 670. In that case, it was sought to fix liability upon the gas company for furnishing gas to consumers using unvented heaters without a public warning when it was known by the company's officials that they were dangerous and widely used in the area.

This higher court refused to hold the gas company liable in damages for death of a consumer who was asphyxiated while using an unvented heater without proper and adequate ventilation through open windows or doors.

"The evidence discloses that the type of heater used . . . was in common use in the vicinity and could be purchased at various places within the city," the opinion stated.

"Concededly, it was neither installed nor maintained by appellee [gas company]. Nevertheless, it is argued that since appellee knew such types of heaters to be dangerous and in common use, it was under a duty to warn the public in some manner or to take steps to avoid dangers necessarily resulting therefrom. We are not impressed by the argument as the authorities generally hold that a gas company that does not install, own, nor control pipes and appliances in a customer's building is not responsible for the condition in which they are maintained."

Can Remain Passive

Another reader asks, "If a person who filed a suit against a gas company delays in the prosecution of the case, can the suit be invalidated permanently?"

Last month a higher court rendered a decision answering this question.

Bock vs Portland Gas & Coke Company, 277 Pac. (2d) 758.

A gas consumer named Bock sued Portland Gas & Coke Company for $100,000 claiming that officials of the company caused him to be arrested for "stealing" gas by making an unauthorized connection with the company's gas lines. This suit was filed February 4, 1949. After four years delay by Bock in prosecuting the case, the court rendered its verdict on January 27, 1953, holding the gas company not liable. On February 2, 1953, Bock filed a motion to reinstate the suit, and on March 25, 1953, that motion was denied. The higher court upheld the lower court's decision to invalidate the suit permanently, saying:

"Where plaintiff [Bock] commenced an action at law and defendant [gas company] is not seeking affirmative relief, duty rests upon plaintiff to prosecute his case to final determination with reasonable diligence. Defendant has a duty to take such steps as required in order to meet action, taken by plaintiff. To this extent, he also should exercise reasonable diligence.

FEATURE
American Gas Journal

Long Term Business Outlook Is Upward As Expansion Plans Continue

John F. Falvey
Financial Editor

A combination of rising stock prices and of declining bond quotations recently has sharply narrowed the difference in yields obtainable on bonds and equities.

At last report, the yield on the 125 industrial stocks comprising the index compiled by Moody's Investors' Service amounted to but 3.70 per cent and the average yield available on corporate bonds used as an index by this same statistical organization increased to 3.31 per cent.

The yield differential of less than 40 basis points thus afforded compares with the differential of 120 points which prevailed at this time last year.

In fact, strange as it may seem, a number of industrial equities currently yield less than bonds, due chiefly to the willingness of investors to pay higher prices for common stocks as a gamble on increased dividends in future.

Commenting on this situation, Dr. Jules I. Bogen recently observed that: "So long as investors generally are confident that the economy is bound to grow, and that cyclical interruptions of that growth will be quite mild and successfully controlled by the Government, the differential between stock and bond yields may not only remain quite narrow, but could disappear altogether.

"Statistics for the period since 1919 indicate, in fact, that until 1935 it was 'normal' for bond yields actually to be higher than stock yields.

"One factor that has helped narrow the gap between stock and bond yields in recent years has been the growing interest in equities on the part of institutional investors. Pension funds in particular have been attracted to equities by the higher yields they have offered. An increase in yields on pension fund investments materially reduces the cost of given pension benefits to employers."

But, Dr. Bogen warns, "institutional investors may not be as eager to rely upon future increases in dividends, as are the rank-and-file of individual investors at the present time.

"The stock market may thus have to depend more upon individual investor demand, and less upon institutional buying, while the yield differential remains as narrow as it is today."

Although it is now pretty much the case of 'water over the dam,' the tremendous recent surge in the volume of mortgage debt outstanding is being reflected in the tight credit now prevailing. According to latest Federal Reserve Board figures, mortgage debt increased by $4.9-billion in the June quarter of 1955, the latest period for which such data are available. This is at an annual increase of nearly $20-billion, or more than 50 per cent above the $12.5-billion increase in mortgages recorded in 1954.

Individual savings cannot begin to match this tremendous surge in mortgage borrowing, whose full impact very probably has not yet been reflected in the capital markets. This is due in part to the practice of some institutional lenders to "warehouse" with commercial banks some of the mortgages for which they have committed themselves. The institutions have merely postponed the date of paying for these mortgages. Then, too, the life insurance companies and savings banks have been selling Government securities in order to buy mortgages.

How well the capital markets will absorb this vast mortgage supply will depend on the trend of savings flowing into the life companies and savings institutions. To date this year the savings flow has not increased, and it might even be showing a slight decline from yast year's levels.

With demand for instalment credit and bank loans also continuing to mount under the stimulus of record-breaking increase in business activity, some restraint upon credit expansion appears sound and proper in order to temper the boom, Roy L. Reierson, vice president, Bankers Trust Co., points out.

"There is always the danger, as the economy approaches effective capacity operations, that a continued rapid growth of credit will stimulate price rises more than it will increase physical output."

Considered alone, he observes, present levels of mortgage and instalment debt probably are not beyond the ability of the public to carry under current conditions of full employment and rising incomes. This is true even though such debt stands at record heights with respect to both dollar amounts and personal income.

However, he warns, the rate at which personal debt has been expanding seems clearly in excess of what can be sustained over a protracted period. Furthermore, the expansion has been accompanied by an extension of maturities and some relaxation in lending standards. The goal of credit restraint at this time, we are reminded, is not to bring about a decline in business activity and employment, but, rather, to reduce the chance of "boom or bust."

"Responsibility for promoting economic stability," declares Mr. Reierson, "is not the task of credit authorities alone. If credit policy is to be effective, its aims and endeavors must be recognized by the financial community, and the actions of the authorities must receive day-by-day support of the major providers of credit, including particularly, of course, the commercial banking system."

Although recent credit restraints are retarding the expansion of bank loans, the closing months of this year will witness sharply higher demands for credit. Treasury new money financing, corporate tapping of the investment markets, state and local governmental borrowing, and mortgage financing, are increasing faster than the accumulation of savings with institutional investors. The prospect of continuing tightness in the money and capital markets is evident.

There is no reason to assume, however, that the monetary authorities want a repetition of the 1953 "credit squeeze." As a matter of fact, they are interested in maintaining orderly conditions and may be expected to act swiftly to prevent acute stringency. According to Reierson, "the prospects of avoiding such a stringency have improved considerably in the past two years as both the Federal Reserve and the financial community have gained experience and familiarity with the operations of a flexible credit policy. Nevertheless, the impact of credit measures upon the market place is always difficult to anticipate; fluctuations might well be greater than either the authorities or the financial community can readily anticipate at the present time."

Despite the continuing healthy state of the nation's economy, the stock market during recent weeks has demonstrated sagging tendencies. This might be traced in part to the fact that share prices had gone to very high levels, and frankly to the point where an increasing number of investors have been unwilling to "chase" prices chiefly on a long term basis, for both capital appreciation and higher dividends. ★

FEATURE
American Gas Journal

Old Days Recalled . . . from

AMERICAN GAS JOURNAL

EST. 1859

90 YEARS AGO

OCTOBER 1865

MR. EDITOR; — *Almost all Gas Companies suffer great loss from leakage of their mains while the gas is being conveyed from the works to consumers. My object in this communication is to enquire from you personally, or through your paper from some of your experienced correspondents, whether this leakage is inevitable, and to be patiently tolerated, or whether some recent improvement in the mode of cementing or packing the joints, or the use of some other material than iron for constructing mains, less expansible and contractible. . . has been discovered and tested. . . . Why would not mains constructed out of good timber — say white-oak logs — well kianised or saturated — after being bored and dressed to proper sizes — with coal tar . . . answer as good or better purpose than metals. Yours Respectfully, F.J.L,. Washington, Pa.*

MR. EDITOR; — *Will you oblige me by giving me in your next issue, the benefit of your experience as to the durability of gas-holders. I have a holder 60 feet diameter by 20 feet deep, which has been in use for 10 years — it stands uncovered, and has been regularly coated with tar and turpentine every summer — the sides are of No. 16 sheet iron, and the roof the same, save in the centre, which is No. 18. The sides are in a perfect state of preservation, but the roof has this season shown signs of decay, in the appearance of numerous little circular holes, the corrosion, or decay evidently taking place inside — I would be glad to know whether this is the common fate of all gas-holders, or, if there is something special in this case to bring about dissolution at an earlier date than is usual. Yours Respectfully,* CANADENSES. *Hamilton, C. W.*

★ ★ ★

The thirty-sixth annual fair of the American Institute is now in full tide of prosperity and popular favor. Crowds daily and nightly fill the spacious building, and objects of interest and curiosity in almost every branch of industry and science, attract the attention of the profound and the inquisitive. While the eyes are regaled by so much that is entertaining, the ear is pleased by the agreeable strains of Dodsworth's band, so well known to our fellow citizens.

We penetrated into the sacred precints of the kitchen, where we found an enthusiastic female of the dominant race, who informed us that she had been a cook for fourteen years — it seemed to us that she must have commenced her profession at six years from her birth, but then we never could accurately determine the age of the colored species — who informed us that she had never found a range, or stove, to please her as much as the Petroleum Stove. . . .

We were attracted by 64 specimens of Fire brick, and materials for Gas Works and Furnaces, from the extensive manufactories of W. B. Kriescher. . . . This being in our line, we examined and endorsed them "all right."

... Messrs. Kitchen & Co. exhibit the Empire State Gas Machine, and the Union Gas Light Co. of Boston, have one of their Portable Gas Machines there also.

50 YEARS AGO

OCTOBER 1905

THE GENERAL GAS LIGHT COMPANY, of Kalamazoo, Mich., is publishing a well illustrated pamphlet on "Store Window Lighting."

THE MUNICIPAL BUILDINGS of Bridgeport, Conn., are to be lighted with gas.

THE MARKET for gas securities is featureless.

THE WRINKLE DEPARTMENT of the Ohio Gas Light Association is now ready to receive contributions for the 1906 collection, and a sketch or description of all devices, formulae and methods of accomplishing objects pertaining to the gas business, is respectfully solicited. Hoping to receive prompt compliance, W. E. Steinwedell, Editor.

INCREASING USE of the Gas Light Sign [title of article].

AT A RECENT MEETING . . . The Detroit Gas Light and Coke Company . . . named was changed . . . is now known as the Detroit Gas and Coke Company . . . President, George W. York; Vice-President, William Greif . . . .

ANN ARBOR, MICH., has contracted with the Gas Company for several hundred street lights.

MAYOR MOORE, of . . . Omaha, Neb., states that in addition to the great reduction in the price of gas below the rate charged to October 1, the Gas Company pays to the city 5 per cent. of its gross receipts and a little over $20,000 per year for the privilege of doing business in Omaha.

Thirteenth Annual Meeting, Michigan Gas Association, held at the Stevens Building in Detroit, Mich., September 20, 21 and 22, was reported in detail.

Some days ago an attempt was made by burglars to blow open the safe of the Cruse-Kemper Company, in its works at Ambler, Pa. The attempt failed, and the miscreants made good their escape, taking with them the money and timepiece of the watchman, William Sweeney, whom they severely wounded . . . .

The Brooklyn Borough Gas Company, of Coney Island, N. Y., is in the market for a gasholder.

The Chicago police records of the 13th inst., show that on the date a thief named "Tony" Gaughan was overcome by gas in the basement of 2119 Archer avenue while attempting to break into the money box of a prepayment meter. In his haste he cut a hole in the outlet pipe and the escaping gas prostrated him. He was dead when discovered.

25 YEARS AGO

OCTOBER 1930

THE PORTLAND GAS & COKE COMPANY, *in their main display room, installed an enormous thermometer which is so arranged that, as the red liquid moves up and goes above 50 degrees, bugs representing danger germs, appear in the fruits, vegetables, etc. shown in the background. The moment the liquid drops below 50, the lights go off and the bugs are no longer visible. . . . this large thermometer in Electrolux refrigerator display has been the source of much interest for passers-by.*

THE A-B STOVE COMPANY, *Battle Creek, Michigan, presents to the gas industry what is described as "Time Controls" — a fully automatic gas range that imposes no penalty on manual operation.*

Gas Industry PERSONALS

Rockwell Announces Two Promotions to Managers

Donald C. Morgan, Chicago, Illinois, district sales manager of Rockwell Manufacturing Company's meter and valve division, has been named central regional sales manager with offices at Pittsburgh, Pennsylvania. Morgan, who joined Rockwell in 1930 as a sales engineer in the Chicago office, replaces Carl C. Moore, whose retirement has been announced.

D. C. Morgan

R. V. Burnette, gas sales supervisor for the central region, succeeds Morgan as Chicago district sales manager.

A native of Clarksburg, West Virginia, and a graduate of Ohio State University, Morgan assumed the Chicago district managership in 1952. Before joining Rockwell, he worked as a mine superintendent for the U. S. Gypsum Company and sales engineer for New Departure Manufacturing Company.

Moore, who also joined Rockwell in 1930, served as general manager of the old Meter Parts Company of Columbus, Ohio, a former Rockwell subsidiary. In 1943, he was named Atlanta, Georgia, district sales manager, and later served in the same capacity at Columbus, Ohio, and Pittsburgh. He became central regional manager in 1952.

Burnette joined Rockwell's sales staff in 1926 and was named gas sales supervisor for the central region in 1949.

James F. Donnelly, has rejoined *A. O. Smith Corporation* as special assistant to F. S. Cornell, vice president and general manager.

Koppers Names Dr. Bachman As Vice-President, Director

Dr. Paul W. Bachman has been elected vice president and director of research and development of Koppers Company, Inc.

A native of Newport News, Virginia, Dr. Bachman was graduated from Johns Hopkins University in Baltimore in 1923 with a BS in chemical engineering. Three years later, he was awarded a doctor's degree in chemistry.

Later, he worked in various research and technical posts for General Chemical Company, the Victor Chemical Company, and the Commercial Solvents Corporation.

Dr. Bachman joined Davison Chemical Company in 1949 as director of development and research.

Wadsworth Is New President Of Pacific Coast Gas Group

Guy W. Wadsworth Jr., president and general manager of Southern Counties Gas Company of California and the incoming 62nd president of the Pacific Coast Gas association, this year marks his 34th year in the natural gas business.

G. W. Wadsworth

It was in 1921 that Wadsworth, still a student at Occidental College, near Los Angeles, began his gas company career, going to work on a parttime basis for F. S. Wade, then vice president of the Southern Counties Gas Company and now chairman of the board of Southern California Gas Company.

Following graduation and a BA in economics, Wadsworth left the company to become assistant financial advisor to the Republic of Haiti.

Three years later, he was back in Los Angeles — and the natural gas business — as personnel manager for Southern Counties.

In 1936, in addition to his personnel work with Southern Counties, he was appointed personnel manager for the then existing Los Angeles Gas & Electric Company, and in 1937, he became personnel manager for Southern California Gas Company.

Personnel testing methods he developed at this time have earned him national recognition. The Humm-Wadsworth personality evaluation test has been adopted by many industrial organizations throughout the United States.

In 1941, Wadsworth was elected vice president and director of Southern California Gas Company. Appointment as vice president in charge of employee relations for Southern Counties followed in 1942.

During World War II, Wadsworth served in the Army Service Forces in Washington, D. C., closing his service as deputy director of the Civilian Personnel Division in the General Staff Corps with the rank of colonel. He was awarded the Legion of Merit for his "outstanding contribution to the war effort."

Following military service, Wadsworth returned to Southern Counties and in 1947, he was elected vice president and assistant general manager and also a director. At that time, he resigned his position with Southern California Gas Company.

He was elected president and general manager of Southern Counties on May 25, 1954.

As such, he heads one of the fastest growing gas utilities in the world. In the last 10 years — 1946 to year-end 1955 — the number of meters served by Southern Counties will have increased 130 per cent.

By the end of this year alone, the utility expects to have connected 53,000 new meters to its lines, bringing the total to more than 500,000.

R. George Claar has been named safety director for *Ohio Fuel Gas Company*.

John C. Deupree has been promoted to sales promotion manager of *Oklahoma Natural Gas Company's* general sales department. *Robert C. Kumler* is advertising manager and *John W. Simmons* is advertising and publications assistant.

A. James McCollum promoted to advertising and publicity manager, *Pacific Gas and Electric Company*.

W. J. Parker now in Cleveland office, Wheelco Instruments division, *Barber-Colman Company*.

Herbert F. Young appointed assistant purchasing agent, *Consolidated Natural Gas Company*.

Officials of Two Companies Testify in Favor of Merger

Officials of Seattle Gas Company and Washington Natural Gas Company testified recently in a Washington Public Service Commission hearing that a merger of the two companies would result in advantages to the area and to the company, in three categories:

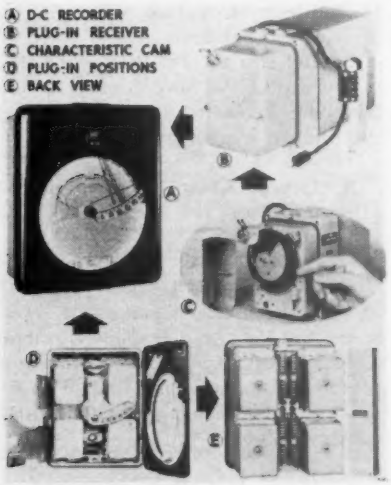
1. More stability for the economy of the area and for the company through diversification of markets.
2. Savings in the cost of service per unit of gas sold and per customer served through operational economics.
3. Better market for the securities of the merged company.

Walter S. Byrne, president of Seattle Gas; Allen Peyser, president of Washington Natural (formerly Washington Gas & Electric Company) and charles M. Sturkey, executive vice president and general manager of Seattle Gas, were witnesses for companies seeking permission to merge.

new Gas Industry equipment

Receiver Recorder — Bailey

A new Bailey Electronic Receiver Recorder is now available for d-c type pickups and d-c telemetering systems.



The recorder may house as many as four, plug-in, d-c receivers, or two receivers and two pneumatic controllers, or two receivers and two pneumatic controllers. Non-linearity inherent in many pickups is extracted by a characteristic cam in the receiver.

Thus, it is now possible to combine four records from d-c pickups, a-c pickups or pneumatic transmitters on the same uniformly graduated, circular chart.

The d-c receiver operates on the potentiometric null-balance principle, using an electronic voltage reference in place of the conventional standard cell and battery. Frequent periodic interruption of measurements or control for standardizing purposes is eliminated.

The receiver is a single, protected package, equipped with unitized, interchangeable component sections.

Bailey Meter Company, 1050 Ivanhoe Road, Cleveland 10, Ohio.

PVC Pipe Fittings— Tube Turns Plastics

The first 3-in. and 4-in. pipe fittings of unplasticized polyvinyl chloride (PVC) to be injection molded on a commercial scale are now being marketed by Tube Turns Plastics, Inc. Included are 90 deg and 45 deg elbows, tees, couplings, and flanges.

The larger size PVC fittings make possible the economical erection of the larger size PVC piping systems now being planned in the chemical, petroleum, and other fields.

All of the fittings manufactured by Tube Turns Plastics, from ½-in. up, are available in normal and high impact PVC and in threaded and socket types, the latter designed for attachment to pipe by solvent or fillet welding.

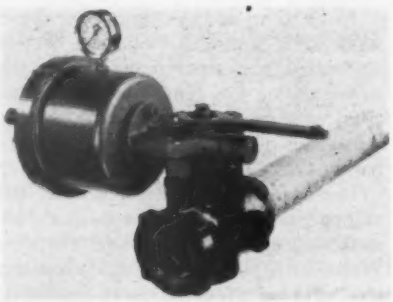
The company's PVC fittings are made by the exclusive Hendry injection molding process.

Tube Turns Plastics, 224 East Broadway, Louisville, Kentucky.

Compact Actuator — Bettis

The Robotarm, a new self-contained, gas-operated, double-acting actuator for remote operations of plug valves and similar mechanisms, has been introduced by the Bettis Corporation.

It is basically a diaphragm separating a large and small air chamber where the front chamber, being the larger, is used to act as an accumulator. Check valves are built into the diaphragm assembly to pass air between the two



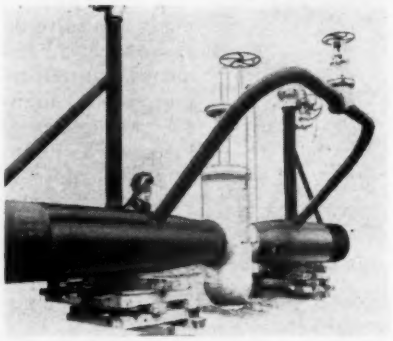
chambers. A rod connected through the packing gland to the diaphragm extends from the larger chamber to operate necessary driving mechanism. For plug-valve operation, the connecting rod works a closed rack and gear assembly furnished to fit compactly over each type of valve.

Features of the Robotarm are: Compact design allows full access to plug valves for lubrication and packing gland adjustments; only one gas operating line is required to open and close, pressure open and automatic pressure close; gas pressure required is 15 to 100 lbs; indicator arm permits visual check of plug-valve opening position and easy installation in the field.

Bettis Corporation, 320 South 66th Street, Houston, Texas.

Multiple Outlet Headers — Ladish

Ladish Company has developed and is producing a new special-purpose fitting that is claimed to simplify in-



stallation and effect 70 per cent saving in welding time required to complete by-pass, blow-down and branch connections to pipe line gate settings.

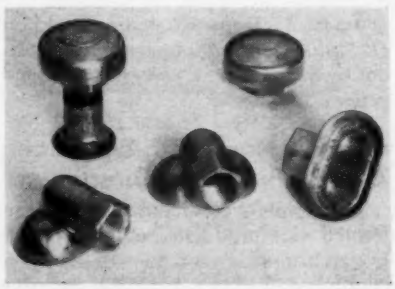
This fitting development consists of a header with multiple seamless outlets in exact specified positions, plus a factory-fabricated conical reducer. New fitting eliminates costly and undesirable practice of nozzling in branch connections and saddle reinforcements.

Since Ladish multiple outlet headers are manufactured to the design requirements of each installation, field work is reduced to a mere matter of making simple butt welds to valves and auxiliary lines.

Ladish Company, Cudahy, Wisconsin.

Breather Vents — Universal

The umbrella or hood type has formerly been made in ¼-in., ⅜-in., and ½-in. sizes with female threads and is now available in ¾-in. size, also with



female threads. The elbow vents are now available with female threads in ½-in. and ¾-in. pipe sizes. This vent is particularly adaptable for use at the outer end of ½-in. or ¾-in. pipe

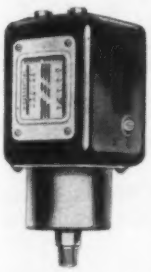
These Universal Breather Vents are die castings of corrosion-resisting aluminum alloy. The internal wire screen that protects against insects is made from No. 16 mesh bronze wire. They are also specially designed to prevent ice formation in the opening.

Universal Controls Corporation, 731 West Davis Street, Dallas 8, Texas.

new Industrial Processing equipment

Pressure Controls — ECA

Fireye 80B pressure controls are designed for many important industrial uses. They provide high and low-limit control for steam, air and non-corrosive liquids and gases. They may be used whenever it is desired to start or stop operations at pre-set maximum or minimum pressures within the range 3-in. vacuum to 240 psi.



On heating installations the new controls may be used for high-limit safety or to maintain steam pressure within set limits.

When used with industrial oil, gas or combination gas-oil burners, the controls supply all required excess and minimum-pressure safety interlocks. High-limit controls open contact on pressure rise, shutting down operation when pilot or main gas line pressure reaches a pre-set safe maximum value. Low-limit controls, installed on steam or air atomizing lines, or on gas or oil fuel lines, open contact on falling pressure, stopping operation when it reaches a pre-set safe maximum value. Low-limit controls, installed on steam or air atomizing lines, or on gas or oil fuel lines, open contact on falling pressure, stopping operation when it reaches an operating minimum.

Calibrated dials on the controls indicate operating and differential pressure settings. Controls mount in any position; standard connection is ¼ in. NPT.

Combustion Control division, Electronics Corporation of America, 718 Beacon Street, Boston 15, Massachusetts.

Lower Priced Gas — Oil Burners — Cleaver-Brooks

Cleavers-Brooks is offering a new line of precision engineered industrial gas burners at prices 30 to 40 per cent lower than previous models.

Lower prices apply to six new gas and gas-oil burners. Capacities range from 720,000 to 8,600,000 Btu. Newly introduced models can be used for gas alone, for light oil (No. 2 grade) gas, and a combination of heavy oil (No. 5 grade) and gas.

All secondary air in these burners is furnished by the burner; thus it does not have to depend on stack draft. Air is metered in the right quantity to provide correct air to fuel ratios for highly efficient combustion.

Burner division, Cleaver-Brooks Company, 326 East Keefe Avenue, Milwaukee 12, Wisconsin.

Dual-Fuel Burner — Roberts-Gordon Appliance

A new (type DFG) industrial combination gas-oil burner recently introduced to the trade is now in production by Roberts-Gordon Appliance Corporation.

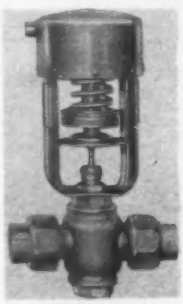
This dual-fuel burner operates on city gas and No. 2 oil and is available in three sizes covering inputs from 360,000 to 4,300,000 Btu/hr. Compact, completely assembled, wired and fire-tested, this combination burner can be readily put in operation in any installation where pressure or temperature changes must cause automatic fuel switch-over. Manual switch-over is possible and can be arranged to over-ride automatic switch-over control.

Built for heavy duty, with plug-in electronic controls, it is designed for easy installation, and adjustment.

Roberts-Gordon Appliance Corporation, Buffalo, New York.

All-Metal Motor Valve — Robertshaw-Fulton Controls

A bellows-equipped, all-metal motor valve with modulating characteristics has been developed by the Fulton Sylphon division of Robertshaw-Fulton Controls for use with hydraulic and pneumatic control systems.



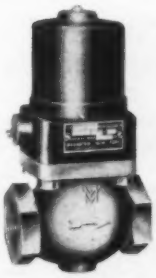
The valve, equipped with a powerful cadmium-plated steel spring and two-ply seamless metal bellows, is used to control the flow of steam, gas, oil, water and other fluids. It is employed as a final control element in pneumatic and hydraulic systems to maintain pressure, temperature or level in industrial vats, tanks and processes.

According to a survey conducted by the company, the new control, called the No. 992-D bellows motor valve, is satisfactory for over 50 per cent of industrial applications where motor valves are used. The series 992-D possesses a linear valve movement and is available in sizes from ¼ in. to 4 in. and in a wide variety of valve types. It comes in direct or reverse-acting styles.

Fulton Sylphon division, Robertshaw-Fulton Controls Company, Box 400, Knoxville, Tennessee.

Solenoid Valve — Magnatrol

A new type of packless solenoid valve that utilizes line pressure to assist the solenoid in opening and closing the valve, has been introduced to the market by Magnatrol Valve.



The valve, called the type "S," is designed for normally closed operation and provides a full port equal to the nominal pipe-size opening. The valve may applied to control automatically or from remote points the flow of steam, hot liquids and gasses not injurious to bronze at fluid temperatures up to 400 F.

Magnatrol Valve Corporation, Hawthorne, New Jersey.

Brazing Machine — Selas

Fast, dependable automatic brazing for many types of small and medium-size assembles is provided by a new self-contained, gas-fired packaged unit developed by Selas Corporation.

The packaged unit uses precise control of combustion and automatic timing to produce sound brazed joints of uniform high quality at high speed. Simple joints in small parts may be brazed by one unskilled operator at rates of 500 assemblies per hour.

All equipment is rigidly mounted on an integral structural steel frame. This equipment includes a Selas Combustion Controller to deliver fuel/air mixture at a predetermined ratio and pressure; fully adjustable Selas burners to provide the optimum heat pattern and heating rate; permanent or replaceable fixtures to support the work components; a dial-type worktable to carry the assembly past the burners in continuous or intermittent motion, and all the necessary automatic timers, pneumatic indexing equipment and electric motors. Provision may be made for specialized functions.

Installation requires only setting the machine in place and making connections to normal shop utilities.

Although this design provides considerable versatility for general brazing operations, each automatic brazing machine is engineered to meet a range of jobs as specified by the user.

Selas Corporation of America, Philadelphia 34, Pennsylvania.

Gas Industry CALENDAR

OCTOBER

12-14 GAMA annual meeting, El Mirador, Palm Springs, Calif.

12-14 Wisconsin Utilities Association, electric and gas section, Schroeder Hotel, Milwaukee.

17 AGA board of directors, Los Angeles.

17-19 AGA-PCGA joint-convention, Los Angeles.

17-21 National metal show (AGA exhibit) Philadelphia.

18-21 American Dietetic Association, St. Louis (AGA exhibit).

18-22 National Safety Congress, exhibition, Chicago.

19 AGA, industrial gas breakfast, Penn Sherwood Hotel, Philadelphia.

20 AGA public information projects committee, Statler Hotel, Los Angeles.

21-Nov. 3 American School Food Service Association, Denver (AGA exhibit).

24-26 American Standards Association, Sheraton Park Hotel, Washington.

24-26 National Motel Show, Morrison Hotel, Chicago.

24-26 Pacific Coast restaurant convention, Biltmore Hotel, Los Angeles.

24-27 National Association of Railroad & Utilities Commissioners, Asheville, N. C.

25 NEGA operating division, Hotel Statler, Hartford, Connecticut.

28 SGA distribution design and construction conference, West Marion Hotel, Little Rock, Arkansas.

28 NEGA home service development conference, Framingham, Massachusetts.

28 NEGA industrial group of G-H-I division (place not determined).

NOVEMBER

2-3 American Home Laundry Manufacturers Association, Palace Hotel, San Francisco.

3-4 AGA-EEI taxation accounting committees, Terrace Plaza Hotel, Cincinnati, Ohio.

3-4 AGA general promotional planning committee, educational service subcommittee, Berkeley-Cartaret Hotel, Asbury Park, New Jersey.

4 Personnel committee. Headquarters.

6-9 Controllers Institute of America, Hotel Statler, Los Angeles.

7-11 National Hotel Exposition, Kingsbridge Armory, New York. (AGA exhibit.)

13-18 ASME, Congress and Hilton hotels, Chicago.

14 AGA accounting section, managing committee, Plaza Hotel, New York City.

14-17 API, San Francisco.

14-18 National Electrical Manufacturers Association, Traymore Hotel, Atlantic City, New Jersey.

16 NEGA Safety Conference. Hotel Statler, Boston.

16-18 Southeastern Gas Association, Roanoke, Va.

18 SGA national gas drilling and production conference, Shamrock Hotel, Houston, Texas.

18 SGA transmission management conference, Shamrock Hotel, Houston.

18 NEGA heating group of C-H-I division (place not determined).

28-30 SGA advisory council and management conference, Point Clear, Ala.

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